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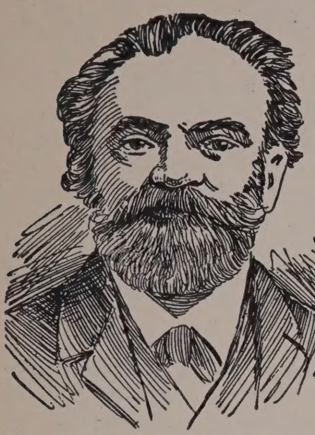


ANTONIN DVORAK

Dvorak (*dvôr zhäk*), **Antonin,** Bohemian composer, was born at Mühlhausen on the Moldau in 1841, and was the son of an inn-keeper. He learned music, it is said, first from the gypsies, but entered the Prague conservatory as bandsman and organist. In 1883 his famous *Stabat Mater*, produced in London in that year, first stamped him as a really great composer, and earned for him later the honorary degree from Cambridge of Doctor of Music. His *Spectre's Bride*, composed for the Birmingham festival of 1885, met with enthusiastic reception, as did his oratorio, *St. Ludmila*, composed for the Leeds festival (1886). In 1892 he wrote a four-act opera, *Dimitrij*, which was first produced in Vienna. In the same year he visited the United States, where he took the direction, for a while, of the National Conservatory of Music at New York, and while there wrote a cantata, entitled *Columbus*, which was produced at the Metropolitan Opera House, New York. His other works include dances, songs and symphonies, an opera, *Jacobin*, and a cantata, *The American Flag*. A further popular work of Dvorak's is *Der König und der Köhler* (The King and the Charcoal-Burner). He died in 1904.

Dwarf, name used especially for people much under the average size of mankind. The ancients believed there were races of dwarfs, and Aristotle declared that eye-witnesses affirmed that many of these little people lived in caves on the banks of the Nile. The most notable dwarf-races of men are the Bushmen, who are about four feet seven inches in height; the Akkas in Central Africa, about four feet ten inches high, by whom Stanley was much troubled in 1881; the Obongos on Gabun River; and the still smaller Batwas, about four feet three inches high. Other tribes of small stature are also reported. In the myths of the old Germanic nations dwarfs play a prominent part. They had their kings and lived in caves within the earth, where they kept treasure and works of art. Dwarfs used to be often kept as court-pets, and lately it has become common to exhibit them as curiosities in shows. The most famous of American dwarfs was Charles Stratton, called General Tom Thumb. When he married Miss Lavinia Warren, in 1803 he was 31 inches in height, his wife being one inch taller. With their child and another dwarf, called Commodore Nutt, they were exhibited through America and England. Flynn of New York, called General Mite, was only 21 inches high. Dwarfs are oftentimes strong for their size and quite intelligent. See *Giants and Dwarfs*, by E. J. Wood.

TIMOTHY DWIGHT

Dwight, Timothy, a well-known American theologian and educator, was born in 1752, at Northampton, Mass., and was a grandson of Jonathan Edwards. He studied at Yale College, was a chaplain in the American army during the Revolution, and settled as a minister at Greenfield Hill, Conn., where he also conducted an academy with great success. In 1795 he became president of Yale College. He died at New Haven, Conn., in 1817. His sermons on theology had a wide influence. See *Life of Timothy Dwight*, by W. B. Sprague, in Sparks' *American Biography*.

Dwight, Timothy, grandson of the preceding, was born at Norwich, Conn., in 1828, and elected president of Yale University in 1886. He was a member of the American committee for the revision of the English version of the Bible. He published in 1872 *The True Ideal of an American University*.

Dwina (*dwē'nȧ*), **Dvina** or **Düna,** the name of two important rivers of Russia. (1) The northern Dwina is formed by the coming together of the Sukhona and the Yuk. It flows in a general northwest direction through a flat country to the Gulf of Archangel. Its length is about 450 miles, and it has several large tributaries, the largest of which, the Viuchegda, is navigable for 500 miles. The river is a valuable channel of inland trade. (2) The western Dwina rises not far from the source of the Volga and the Dnieper, emptying into the Gulf of Riga. Its course is 500 miles long, part of which is navigable. It is connected with the Dnieper, and thus with the Black Sea, by the Beresina Canal, and by other systems with the Caspian Sea, the Neva and the Gulf of Finland.

Dyaks. See BORNEO.

Dyment, Albert E., born at Lynden, County of Wentworth, Ontario, 1869. His father English, his mother Scotch, Educated at Barrie Collegiate Institute and at Upper Canada College. A prosperous manufacturer and dealer in lumber. Elected for Algoma to the House of Commons in 1896 and in 1900 and for

Algoma East in 1904. Is Honorary Lieutenant-Colonel of the 97th Regiment in 1907. A Liberal.

Dynam'ics is that science whose aim it is to describe most completely and most simply the motions which occur in nature. This is the definition given by Kirchhoff. But his illustrious colleague, Helmholtz, defines dynamics as the science of those phenomena in nature which may be reduced to the motion of ponderable masses. The difference between the two definitions is slight; and it vanishes completely if we assume that *all* the phenomena of nature can be explained, ultimately, in terms of matter in motion.

Perhaps the simplest method of getting a clear idea of the object and the method of dynamics is to consider the orderly sequence of steps by which this science, in its modern form, has been built up.

KINEMATICS

1. Before the motion of a particle can be described, we must be able to define the position of that particle: for motion is merely change of position. For this purpose dynamics makes use of the ordinary geometry of position. As is well known to everyone, when we wish to locate a point on the earth's surface, we must tell three things about it, namely, its latitude, its longitude and its height above the sea-level. So in dynamics it requires always three specifications (called co-ordinates) to locate a particle. Knowing how to locate points, one can then easily locate any rigid body. For if any three points (not in the same straight line) in such a body are fixed, the entire body itself is fixed.

2. The second step in dynamics is to describe the change of position or displacement in bodies. But since change of position is the same kind of quantity as position itself, we still use simply the geometry of position for this purpose.

3. The third step is to describe the rate of change of position. This introduces a new quantity, time. To measure time we use a body in uniform motion, that is, we use a body which is set in motion and let alone. The most uniform motion that we know anything about is the rotation of the earth on its axis. Accordingly the average period of rotation of the earth with respect to the sun is called a day. And 1-864,000th part of a day is called a second. This is the unit of time most frequently employed in dynamics. The idea of time being clear, the rate of motion or the velocity of a particle is defined as "the ratio of the change of position to the time occupied in this change." The numerical value of any velocity, without reference to its direction, is called its speed.

4. But since practically all velocities in nature are changing, the fourth step in dynamics is to define the rate of change of velocity. This is called acceleration, and is measured by the ratio of the change in velocity to the time occupied in the change.

Up to this point we have considered merely the motion of a body, but have not asked any questions concerning the causes of these motions. This science of motion alone is called kinematics, which is merely a Greek word for science of motion. Kinematics may be taken as a purely mathematical subject; but, as a matter of fact, it nearly always forms the first chapter of any treatise on dynamics.

DYNAMICS

5. Passing now to the thing in motion—that which we call matter—we find that the quantity of it can be measured just as it was in the case of time and space; but we cannot define it, any more than we could time or space. Time may be called duration and space may be called extension; but no one is any the wiser for all that. So the amount of matter in a body is called its mass; but this is not a definition of matter; it is merely a convenient name for the amount of substance in any body. The measure which is employed for matter is its *inertia*, that is, its tendency to remain at rest if it is at rest or to remain in motion if it be in motion. If one body is twice as hard to set in motion as another, it is said to have twice the inertia of the other, that is, twice the mass of the other. It was shown by Newton that all bodies, regardless of their chemical composition, are attracted by the earth with forces which are strictly proportional to their masses. And hence we use the balance when we wish to compare (*i. e.*, to measure) two masses.

These three ideas, mass, space and time, are the fundamental concepts of dynamics. Proceeding from these, Galileo, Huygens, Newton and Lavoisier constructed what might be called the first modern system of dynamics. The experimental facts which lie at the foundation of this system are Newton's laws of motion and Lavoisier's discovery of the conservation of matter.

NEWTON'S LAWS OF MOTION

Before these experimental facts can be stated in a clear and definite manner, it is essential to introduce two more fundamental quantities, viz., the linear momentum of any body, which is defined as the product of its mass by its velocity, and the force acting upon any body, which is defined as the product of its mass by its acceleration; or, what amounts to the same thing, the time-rate at which the linear momentum is changed. Newton's laws may now be stated as follows:

I. If a body is in translation under no external force, its linear momentum remains constant.

II. The change in the linear momentum of a body is proportional to the force acting upon the body; and the direction of the change is the same as the direction of the force.

III. Action is always equal and opposite to reaction; by which is meant that the mutual forces of any two bodies or of any two parts of a body are always equal and oppositely directed.

Lavoisier showed that the amount of matter in any isolated system cannot be increased or diminished by any known means: and therefore, presumably, that "the amount of matter in the universe is a constant."

6. The next great step in dynamics is the introduction of the idea of work and energy. Work, in dynamics, is employed to denote one definite quantity, viz.: the product of a force multiplied by the distance through which it is exerted, both distance and force being measured in the same direction; while energy is defined simply as the ability to do work, and is, therefore, measured in the same units as work.

By 1847 Helmholtz, together with a number of his contemporaries, had proved that though the energy which a system of bodies possesses may assume a great variety of forms, yet the amount of that energy is a constant quantity. The energy of the universe is continually undergoing transformation; but there is no evidence for thinking that the slightest bit of energy has ever been annihiliated or created by man. This summary is known as the principle of the conservation of energy. Nearly all the problems of dynamics are solved by applying to the particular case in question either Newton's laws of motion or the law of the conservation of energy.

DYNAMICS OF ROTATION

7. A very great simplification in the treatment of dynamical problems is secured by the fact that all cases in rotation may be solved not only by the same principles, but by the same formulæ, as in the case of translation.

We have only to replace linear displacement, x, by angular displacement, θ; and linear inertia, m, by rotational inertia, I. The following table gives a summary of the principal quantities involved in translation and rotation, and shows that they are identical in form in the two cases:

TRANSLATION		ROTATION	
Inertia (= Mass)	m	Rotational inertia = moment of inertia	I
Linear Displacement = change of position	x	Angular Displacement	θ
Time	t	Time	t
Linear Velocity	$v=\frac{x}{t}$	Angular Velocity	$\omega=\frac{\theta}{t}$
Linear Acceleration	$a=\frac{v}{t}$	Angular Acceleration	$\gamma=\frac{\omega}{t}$
Linear Momentum	$M=mv$	Angular Momentum	$G=I\omega$
Force	$F=ma$	Moment of Force	$L=I\gamma$
Energy of Translation	$E=\frac{1}{2}mv^2$	Energy of Rotation	$E=\frac{1}{2}I\omega^2$

8. Up to this point we have no principle which will determine the direction in which any dynamical process occurs. The law of the conservation of energy would be equally well-satisfied whether a clock-weight ran down and delivered energy to the clock-train and the air, or whether the clock-weight ran up, deriving the necessary energy from the heat in the train and in the air. It has been found convenient to divide all kinds of energy into two groups—energy of position and energy of motion—called potential and kinetic energy respectively. And it has been discovered by Clausius, Kelvin, Helmholtz and others that, in general, "the potential energy of any system tends to become a minimum." Armed with this theorem, which is, perhaps, the most general principle of dynamics, we are prepared for the solution of all the ordinary problems of mechanics. The method in general consists in writing, in the form of equations, the six conditions of equilibrium, namely, that all the forces shall be zero and that all the moments of force shall be zero, and then solving for the quantity desired.

Upon the eight general principles enunciated above are constructed the entire superstructures of astronomy, physics and mechanical engineering.

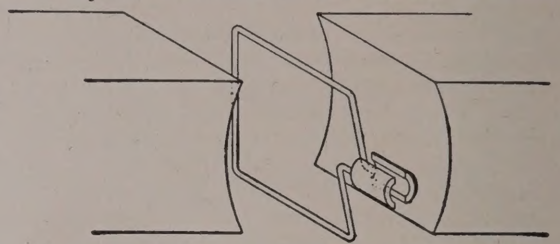
For the history of the subject see Mach's *Science of Mechanics*, translated by McCormack; for the laws of motion see Tait's *Newton's Laws of Motion;* for a treatment of rotation see Worthington's *Dynamics of Rotation.*

Dynamite, from a Greek word meaning strength, is produced by mixing nitro-glycerine with a kind of earth, known under its German name of *keiselguhr.* Nitro-glycerine was discovered in 1846, but it was not till 20 years after that the experiments of Alfred Nobel, who combined it with the earth just mentioned, made it of practical importance. Dynamite has a reddish-brown color, and is about one part earth to three parts nitro-glycerine. It burns with a yellowish flame and, in small quantities, without danger. The time of an explosion of a dynamite-cartridge is about the 24,000th part of a second. Dynamite is much used for breaking up bowlders, and is used under water as well as on land, the water causing the loss of only six *per cent.* of its power. For quarrying purposes gunpowder is generally used, as dynamite breaks up rock too much. Dynamite is also used in explosive shells that may be fired from guns of special construction, a dynamite gun having been invented in 1883. Unfortunately, it has been also employed for the destruction of life and property.

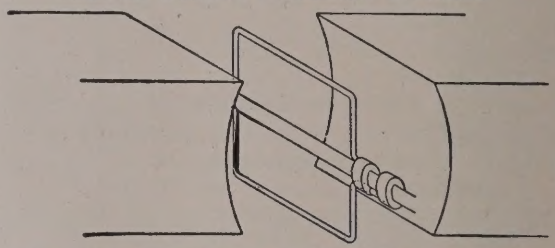
Dynamo. See Electricity.

Dynamo-Electric Machine or, simply, dynamo, a machine for generating an electric current in a conductor by moving the conductor in the magnetic field of a magnet or system of magnets. The motion is relative, that is, either the conductor or the magnet may be the moving part. All dynamos are based upon the fundamental discovery made by Michael Faraday in 1831. Faraday discovered that, if a wire forming a part of a circuit is moved across the space (called a magnetic field) in front of the pole of a magnet, an electric current will be set up in the wire and circuit during time of motion. The modern dynamo consists of two essential parts: (1) an electro-magnet or system of electro-magnets called the field-magnets and (2) a system of copper wires, usually wound on a laminated iron core. This system of conductors is called the armature, and is the part in which the current is generated. In most varieties of dynamos the armature revolves in the magnetic field of the field-magnets, but in many large alternating-current dynamos the field-magnets form the revolving part.

Dynamos are divided into two general kinds: direct current (D. C.) and alternating-current dynamos (A. C.) or simply alternators. The current generated in the circuit of a D. C. dynamo is constant in direction and magnitude. The current produced by an alternator reverses direction at regular intervals. All commercial D. C. dynamos have a commutator. This is a metal cylinder built up of a number of insulated sectors or bars, which revolves with the shaft on the armature. Fixed conducting-brushes rest against this commutator and make the connections with the external circuit. The armature-coils are connected with the commutator-bars, so that the connections with the external circuit are reversed as often as the current in the armature is reversed. In this way the current in the external circuit is kept constant in direction. The collecting device for a simple A. C. dynamo consists of two insulated copper-rings on which the brushes rest. The current in the external circuit is thus reversed as often as the current in the armature-coil is reversed. The common number of alternations or reversals (often called cycles) in commercial alternators is either 125 or 60, but as low as 25 are used in the Niagara Falls electric plant.



SIMPLE DIRECT CURRENT DYNAMO

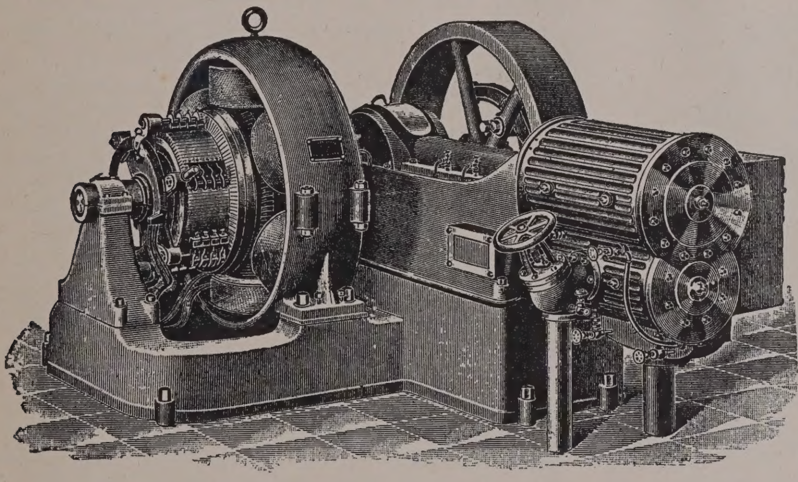


SIMPLE ALTERNATING CURRENT DYNAMO

Alternators are often built to generate two or more alternating currents, which differ in "phase." Such machines are called two- or three-phase alternators. Thus a two-phase machine is one which generates two separate alternating currents, the two currents differing in that the first reaches its maximum when the second is at zero, and when the second reaches a maximum the first is passing through its zero, and so on. Apparatus generating and using two or more phases is called polyphase apparatus.

The use of alternating currents has increased very largely within recent years, because of the inventions of transformers and of the induction-motor. The polyphase alternating-current system is the only one commercially feasible for long-distance transmission of electric energy (see TRANSFORMERS and TRANSMISSION OF POWER), and even for many shorter lines there are engineering advantages in its use. The field-magnets of some of the earlier dynamos were permanent steel magnets, and such machines were called magneto-electric machines or magnetos. The little dynamos used in telephone call-boxes are magnetos. The field-magnets of all modern machines are electro-magnets. The machine is spoken of as bipolar or multipolar, according as the field-magnet system has two or more poles. The field-magnets of most alternators are separately excited by an electric current from a small auxiliary dynamo called the exciter. The field-magnets of most D. C. dynamos are excited by the current generated by the dynamo itself. If all the current of the armature passes through the field-coils, the dynamo is said to be a series-wound machine; if only a fraction of the armature-current goes through the field-coil, the dynamo is a shunt-wound machine. When there are two sets of field-coils, a series-set and a shunt-set, the dynamo is said to be compound-wound. The choice of the kind of field-windings is a question of regulation of the current-output with different loads.

Dynamos are rated in kilowatts as steam-engines are rated in horse-power. A kilowatt (K. W.) is almost exactly equal to one and one third H. P. Thus a 75 K. W. dynamo has the same work-capacity as a 100 H. P. steam-engine. To get the K. W. of a dynamo, divide the product of the volts and amperes by 1,000. The use of electrical machinery for power-purposes has made a demand for large dynamos, often reaching several thousand K. W. for one machine. Thus in the Niagara Falls plant there are ten machines, each of 5,000 K. W. output.



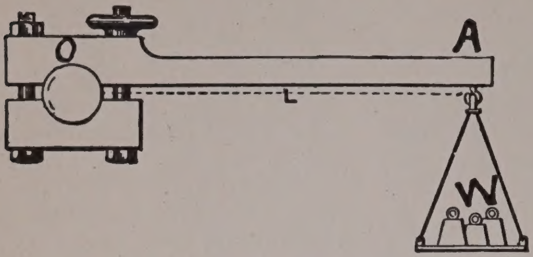
DIRECT CONNECTED DYNAMO AND ENGINE

Faraday and others saw immediately that his discovery of electromagnetic induction (1831) could be used for the continuous production of electric currents, but the modern machine was evolved slowly and represents the added ideas of more than a generation of inventors. The first machine had permanent magnets. In 1832 Pixii devised a commutator. In 1848 Brett suggested the self-exciting electromagnet for the field. The name dynamo-electric machine was first given by Dr. Werner Siemens in a paper read before the Berlin academy in 1867. In 1870 Gramme invented the ring-armature, and three years later Hefner-Alteneck improved the early form of Siemens armature and gave us the present drum-armature. The ring- and drum-armatures have been used more than any others in D. C. dynamos. The theory of the dynamo-machine has been studied carefully by Hopkinson, Steimetz, S. P. Thompson and others, so that the designing of a dynamo for any specific purpose has been reduced to a question of exact calculation. The efficiency of modern dynamos is often 96 to 98 *per cent.* The largest makers of dynamo-electric machinery in the United States are the General Electric Company, and the Westinghouse Electric and Manufacturing Co.

The shops of these companies are among the largest manufacturing-plants of any kind in the world.

A. P. CARMAN.

Dy'namom'eter, strictly an instrument to measure a force tending to produce motion. Thus, a spring-balance is sometimes called a dynamometer. The term, however, is commonly applied to an instrument to measure power. Power is rate of doing work. Work is force overcome through distance. The unit of work used in engineering is the work done in raising a pound-weight one foot against gravity, called a foot-pound. When a machine does work at the rate of 33,000 foot-pounds in one minute, the power is one horse-power (H. P.). The power-unit used by electricians is a kilowatt (K. W.), equal to 1⅓ H. P. A dynamometer is technically used in engineering for any device which measues H. P. One of the simplest and most common forms is the Prony brake. A block B is clamped fairly tight on the pulley O of the machine. The machine then does work against friction. The force is balanced by the weight W on the lever-arm AO. From the speed of rotation, the lever-arm and the force W, the power is directly calculated. For the many forms of dynamometers, see J. J. Flather's text-book on *Dynamometers*. A wattmeter measures electrical power in watts. It is an instrument for measuring the product of the pressure (volts) and current (ampères), which gives the watts directly. The best known forms are those of Siemens and the modified forms of Weston.



PRONY BRAKE

Dyne (*dīn*), the unit of force employed in the metric system. It is defined as that force which, acting upon a mass of one gram, will produce unit-acceleration. If we denote the acceleration of gravity by *g*, then the weight of one gram is equal to *g* dynes. And, in general, we may say that the weight, W, of any body whose mass is *m* grams is *mg* dynes, or

$$w = mg \text{ dynes.}$$

A definition of the dyne which is exactly equivalent to that given above is the following: That force which, acting for one second, will produce unit-change of velocity in a mass of one gram. A *megadyne* is a force of one million dynes, and is about two *per cent.* greater than the weight of a kilogram.

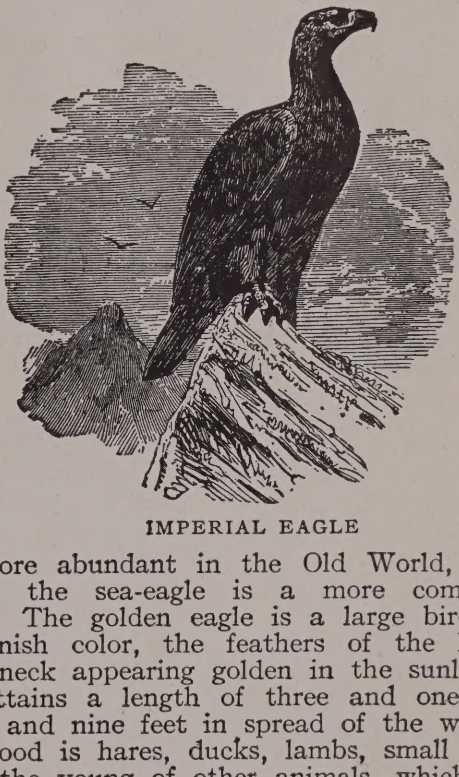
E

E, the fifth letter, is a vowel. It represents seven sounds, the principal ones being the long sound in *eve* and the short sound in *best*. Variations of long *e* are heard in *event* and *eight*, of the short *e* in *excuse* and *horses*, the absence of accent on these *e's* affecting their quality. Other *e* sounds occur in *ever*, *where*, *whereby*. *E* at the end of words usually is silent, but indicates that the preceding vowel is long, as in *came*. Final *e* after *c* and *g*, as in *lace* and *rage*, shows that *c* is *s* and *g* is *j*. *E* occurs in English words far more frequently than any other letter. Its *ā* sound comes from the Latin.

Eads (*ēdz*), **James Buchanan.** Men with genius for mechanics, as for art, usually give indication of it very early in life. This famous engineer, who built the Eads bridge across the Mississippi at St. Louis, constructed models of saw-mills, fire-engines and steamboats before he was ten years old. He was born at Lawrenceburg Indiana, in 1820. This was before the day of railroads. The commerce of the country was carried on over the waterways, and the Ohio swarmed with every kind of boat that was in use. Perhaps this is the reason the man came to be identified with rivers; the deepening of their channels the bridging of them, the construction of boats, the protection of their banks from erosion.

When he was 13 the family moved to St. Louis, where river life was on a larger, more dramatic scale. One of the first things he did to attract attention was the raising of wrecked boats, for which work he invented improved hoisting-machinery. When the Civil War broke out, he was called to Washington and given a commission to build iron-clad gunboats to patrol the Mississippi. His feat of building and equipping eight such boats in 100 days gave him world-wide fame. From 1867 to 1874 he was engaged in bridging the Mississippi. The Eads bridge is still considered the finest example of metal-arch construction in existence. His next undertaking was the improvement of the South Pass of the Mississippi delta by the use of jetties. Congress approved of his plans to introduce the jetties all the way up to the mouth of the Ohio, but the cost was enormous and the work was never completed. Mr. Eads also proposed to build a ship-railway and then a ship-canal across the Isthmus of Tehuantepec, Mexico. Had he lived, this route might have been adopted rather than Panama. He died at Nassau, Bahama Island, March 8, 1887. He received the Albert medal from Queen Victoria and many other decorations and honors from governments and universities. His ashes were scattered on the flood-waters of the Mississippi, according to his will, from the Eads bridge, his only monument.

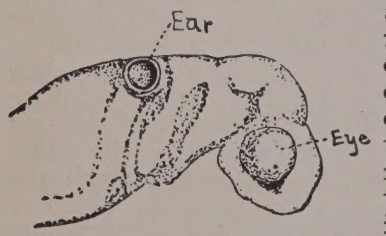
Eagle, a large bird of prey, related to buzzards and vultures. There are forty or fifty species of eagles in all countries of the world, but only two kinds occur in North America. These are the golden eagle, common to Europe, Asia and America, and the baldheaded eagle, which is peculiar to North America. The golden eagle is a magnificent, mountain-loving bird; it is found in the United States from Mexico northward, but is far from common. It is more abundant in the Old World, but there the sea-eagle is a more common bird. The golden eagle is a large bird of brownish color, the feathers of the head and neck appearing golden in the sunlight. It attains a length of three and one-half feet, and nine feet in spread of the wings. Its food is hares, ducks, lambs, small pigs and the young of other animals, which it carries away in its talons. It lays two or three whitish eggs with brown spots, usually on inaccessible cliffs. The baldheaded eagle belongs to the group of the sea-eagles and lives near water; it is found on rivers



IMPERIAL EAGLE

and lakes and especially along the seacoast. It is slightly smaller than the golden eagle, having an expanse of wing of about eight feet. The feathers on the head and upper part of the neck are white, which gives it the name of baldheaded. It feeds largely on fish, sometimes catching them for itself, but, when opportunity offers robbing the fish-hawk or osprey. It frightens the osprey into dropping the fish which it has caught, and then catches it in its own claws before it reaches the earth. These birds usually nest in high trees, and lay two eggs of dull white color. Among other varieties are the harpy-eagle, the serpent-eating eagle, etc. Eagles are supposed to attain a great age. They have long stood as the emblems of war and power, and have been the standards of war in several countries. The famous war-eagle of the United States — Old Abe — was stuffed and preserved in the state-library at Madison, Wis.

Eames, Emma (Mrs. Julian Story), American soprano singer, also famed for her beauty, was born at Shanghai, China, Aug. 13, 1867, and is the daughter of an American lawyer then employed in the international courts at Shanghai. Her early years were spent at Bath, Me., her musical studies being directed by her mother, and under instruction in Boston. In 1886 she proceeded to Paris, where she was a pupil of Mme. Marchesi, and appeared in 1888 at the *Opéra Comique*, and in the following year made her debut in grand opera in Gounod's *Romeo et Juliette*. She sang with Mme. Patti and with the brothers De Reszke, and met with great success. In England she appeared at the Covent Garden theatre, London, in her impersonation of *Marguerite*. In the United States she added to her high reputation as a primadonna, and won fresh laurels under Herr Grau, in her famous operatic parts, including Wagnerian rôles. Her repertoire is extensive, and not only English but in French, German and Italian. In 1891 she married a son of W. W. Story, the well-known American poet and sculptor. In 1908 they divorced, and in 1911 she married Emilio de Gogorza, an eminent baritone.

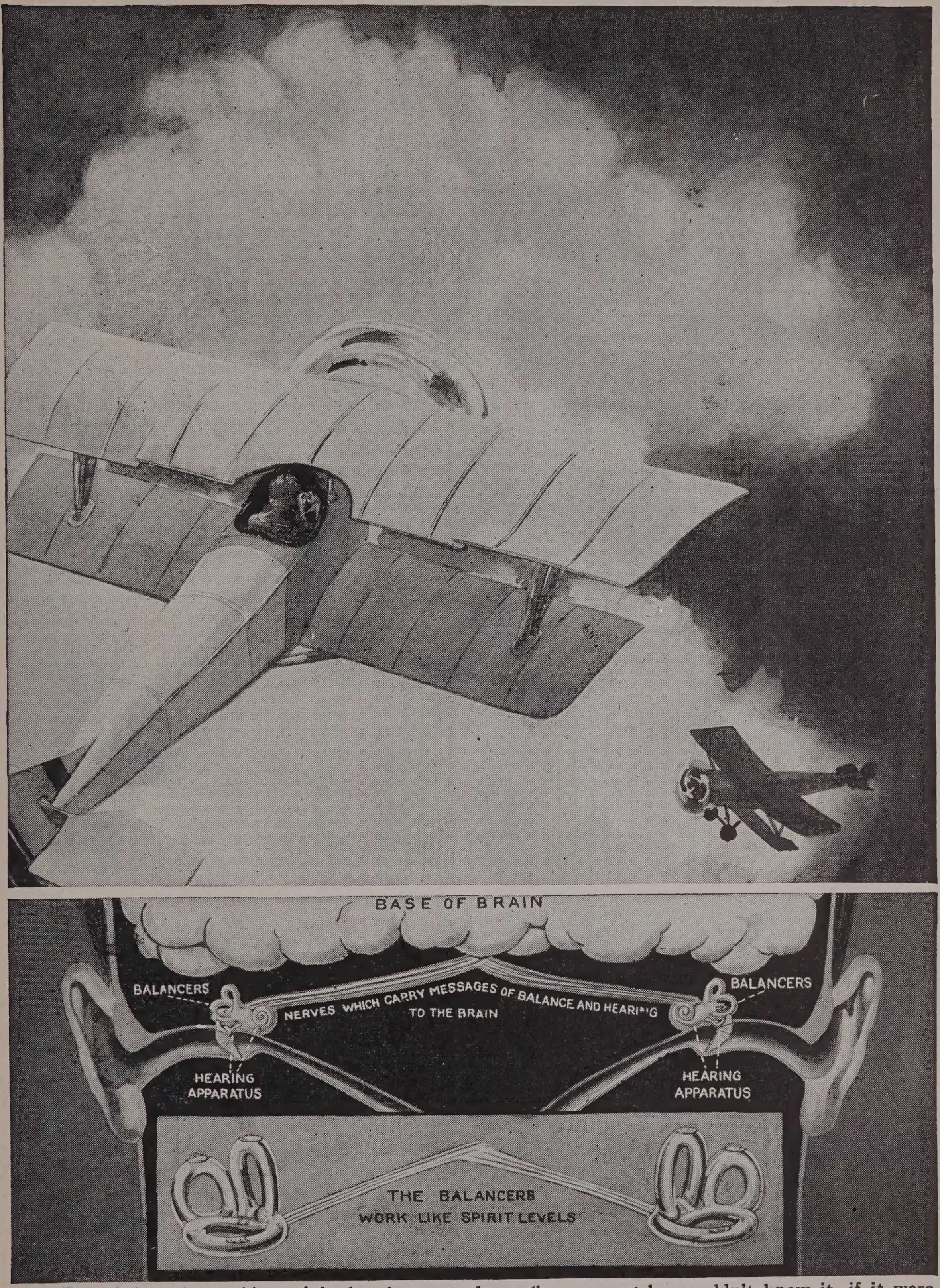


Head of embryo shark showing beginning of ear

Ear, the organ of hearing, especially adapted to receive sound-vibrations from the air. The ear is merely the receiver; it must of course be connected with the brain by the nerve, otherwise there is no hearing. The parts of the ear are thrown into vibration by the sound-waves, and these vibrations are conveyed by the nerves to the brain. If the nerves are destroyed and all the other parts left perfect and uninjured, there, nevertheless, is no hearing. Receiving organs of this kind are placed on the surface in order that they may be in contact with the external world. They are called end-organs or sense-organs. The ear is one, the organs of sight, smell. taste and touch are others. Ears are found very low in the scale of animal life. In the simpler forms they consist of little bags filled with fluid, in which are small, hard particles called ear-sand or ear-stones. The shaking of the bag causes the fluid to vibrate, and the ear-sand is also put in motion, which increases the effect upon the nerves of hearing. In all the vertebrated animals the ear, in common with the other sense-organs, begins on the surface as a patch of the outer cell-layer. There are two round patches on each side of the head, which become sunk in like small saucers (see illustration). The ear starts in this way in all fishes, amphibia, reptiles, birds and mammals. In this stage it is called the ear-saucer or ear-pit. Soon it begins to close by the growth of the skin over it; it becomes a sort of pocket, at first open and then closed, after which it is called the ear-vesicle. From this ear-vesicle, which is little more than a sac, arise gradually all the other parts of the inner ear. In the higher animals three parts are recognized: an outer, a middle and an inner ear. The outer ear includes the part that can be seen and the tube leading inward from the surface. Ear-wax is formed within the tube, and a membrane is stretched across its inner end, called the tympanic membrane. The middle ear is a space filled with air, bounded by the membrane on the outside and the bony wall of the internal ear on the inside. The space is crossed by a chain of three small bones, called the hammer, the anvil and the stirrup. The hammer is fastened to the tympanic membrane, and the stapes to a small oval membrane which covers one of the small openings through the bone into the bony cavity that contains the inner ear. The cavity of the middle ear also communicates with the throat through a passage called the Eustachian tube.

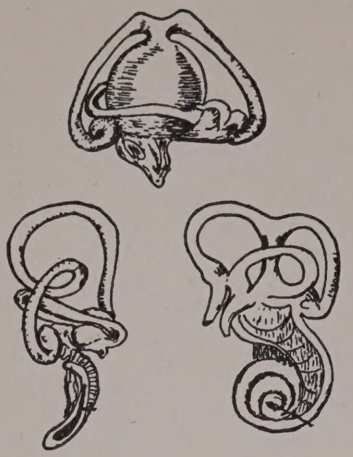
In reptiles and birds there is a single long bone in the middle ear, instead of three bones as in the higher animals. The inner ear is the essential part, in fishes the only part. The middle ear is gradually developed and the external ear added to it as we go up the scale of animal-life above the fishes. The inner ear consists of an upper portion from which three semicircular canals arise, and an inner part which in the higher animals is coiled like a snail-shell and called the cochlea; but this part is fully developed only in mammals (see illustration). The illustration shows the inner ear of a reptile, a bird and an ox. Notice that in the

THE BIRD MAN AND HIS EARS


BASE OF BRAIN
BALANCERS
BALANCERS
NERVES WHICH CARRY MESSAGES OF BALANCE AND HEARING TO THE BRAIN
HEARING APPARATUS
HEARING APPARATUS
THE BALANCERS WORK LIKE SPIRIT LEVELS

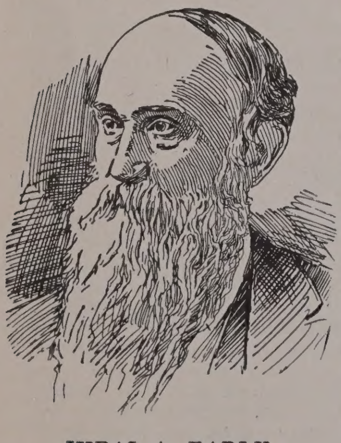
The bird-man's machine might be almost ready to tip over and he wouldn't know it, if it were not for his ears. When above the clouds, he can't see the horizon and so his eyes don't tell him when his machine is tipping. He must depend on his sense of balance located in six little tubes, three on each side of the head. We all have them, but unless they are in good working order, we could never learn to fly. They work like spirit levels. Inside of these tubes, which are filled with water, are hollow nerve fibers also containing water. When we tip our heads the water shifts and tells the brain in what direction we are tipping. So before a young man is allowed to train for flying service in the Army, he is examined very carefully to make sure he has the proper sense of balance.

reptile there is no cochlea, only a small projection in place of it; in the bird this projection is longer and curved; and in the ox it has become long and coiled like a snail-shell — the true cochlea. The semicircular canals are present in all three. It is in the cochlea that the most complicated structures are found. The principal branch of the ear-nerve enters here, and becomes connected with certain large cells provided with hairs that vibrate when sound-waves reach them. The whole is inclosed in very hard bone, so that there are a bony part and a membranous part to the internal ear. The membranous part consists of closed sacs full of fluid, and these are also surrounded by a fluid. Thus the arrangement is exactly suited to receive vibrations and transmit them to the ear-nerves. In the cochlea are many little organs, standing side by side on a membrane and forming an arch or tunnel by arching toward each other. These are the organs of Corti. They vary in size, and possibly respond to different sets of sound-vibrations; but, on the other hand, it is possible that they simply act as dampers, somewhat like those in a piano, to prevent the too long vibration of the parts of the membrane upon which they rest. For fuller descriptions of the ear see text-books on anatomy and physiology. See, also, SOUND.



The inner ear of a reptile (above), a bird (to the left), and an ox (to the right)

Early (*ẽr′lĭ*), **Jubal Anderson,** a Confederate general, was born in Virginia in 1816. He graduated at West Point and served in the Florida and Mexican Wars, and was practicing law when the Civil War broke out. He entered the Confederate service as a colonel, and was in the battles of Bull Run, Fredericksburg and Gettysburg. He was defeated by Sheridan in several battles and also by Custer at Waynesboro, after which he was relieved of his command. He died at Lynchburg, Va., March 2, 1894.



JUBAL A. EARLY

Earth is the name given to the third planet in order from the sun. Like other members of the solar system, it revolves in an elliptical orbit, in one focus of which is the sun. The average distance of the earth from the sun is 92,800,000 miles. The earth has one moon, at a mean distance of 238,800 miles. It was anciently believed that the earth was a flat disk of land surrounded by water. It is now known that it has approximately the form of a sphere. On a wide, smooth surface, such as the sea, the upper part of a distant receding object, as a ship, remains in sight after the lower part has disappeared. This could be true only if the earth were round. The position of the stars shows the same thing. If one travels south, new stars, which before could not be seen, rise into view. Another very convincing proof is the fact that vessels steering always in the same general direction have gone round the earth, coming back to the point from which they started. The earth is not a perfect sphere, but is flattened slightly at the poles. If it were a perfect sphere, the arc of the surface, corresponding to a definite angle at the earth's center, would be equal in every part of the circumference. But it is found that an angle of one degree has a longer arc toward the north and toward the south than near the equator, thus showing that the polar regions are flattened and the equatorial regions bulge out. Delicate experiments also show that the force of gravity is greater near the poles than at the equator; but this can be true only if the center of the earth is closer to the other attracting body at the poles than at the equator; that is, the polar regions must be flattened so as to lie nearer the earth's center than is the equator. The shorter diameter of the earth is 7,899.6 miles, while the equatorial diameter is 7,926.6 miles. The character of the earth's interior can be inferred from certain tidal phenomena which have led Lord Kelvin to the conclusion that the rigidity of the earth is greater than that of glass. Estimates regarding the age of the earth vary enormously. Kelvin places it somewhere between 20 million and 400 million years.

The earth has four principal motions: that of rotation on its own axis; that of revolution around the sun; that of precession; and that of nutation. As it rotates on its axis half is always exposed to the sunlight and half is always in darkness, one rotation being made every 24 hours. The time taken for the revolution of the earth around the sun is 365¼ days, and forms our year. If its axis were exactly perpendicular, the days would always be the same length. But in fact its axis is inclined at an angle of 23½°; and thus, when the northern end of the axis is directed away from the sun, the rays of light and heat do not reach it, but, on the other hand, the sun's rays continually shine upon the southern end. This period is the winter of the northern hemisphere. When the earth has moved a quarter of the way around its orbit, the sun's rays reach both the north and south poles. At the end of the second quarter of its revolution—or the summer solstice—the northern end of the axis is inclined toward the sun, and thus is continually lighted; while at the third quarter of the revolution once more the light reaches both poles. In the first position, the further north we go the shorter is the time during which the sun's rays touch any one point, and thus the days are short and the nights long; and, as the days are short and the sun shines only for a short time, the weather is cold. This is the season of winter. Now, as the earth moves through the first quarter of its orbit, the days become longer on the northern hemisphere and shorter in the southern, till they become just equal about the 21st of March. This is called the spring-equinox. At the end of the second quarter the days are long in the north, the nights short and the season therefore warm; and at the third quarter once more the length of days and nights becomes equal, about September 23. At the summer-solstice of the northern hemisphere, when the north pole is inclined toward the sun, sunlight falls 23½° beyond the pole, and, as the earth rotates, all this region remains in daylight the whole 24 hours. At this time the south pole is turned away from the sun to the same extent. The circles bounding these regions of continuous daylight or darkness at the solstices are called the Arctic and Antarctic circles, and the spaces within them the north and south frigid zones. At the same time the sun is vertical at a distance of 23½° north of the equator. This is the highest northern latitude at which the vertical sun is experienced, and is called the tropic of Cancer, from the constellation in which the sun appears at that time. At the winter-solstice of the northern hemisphere the sun is vertical at a distance of 23½° south of the equator, or on the tropic of Capricorn. As the sun appears overhead in all places between these tropics twice in the year, and thus exerts its greatest heating power, this broad belt of the earth is called the torrid zone. The belts between the tropics and the polar circles are called the northern and southern temperate zones.

The sun's heat is constantly at work breaking down the higher rocks and spreading the broken matter as soil over the lower ground. The circulation of water is the great instrument for this work: vapor raised from the oceans and carried by winds is condensed as rain on the highlands, and, returning to the sea in the forms of springs and streams, has a chief share in wearing down the surface of the land. This process would finally reduce the land to a common low level, were it not counteracted by the continual gentle elevations and depressions of the surface, due to internal changes. Animal and vegetable life is spread all over the globe and has had a large share in producing the condition and aspect of many parts of the earth, as is witnessed by the great coal-fields of the earth, the chalk, limestone and marble found in many regions and the coral reefs and islands of tropical seas. Man, too, has helped to change the appearance of the face of the earth.

The average density of the earth is about five and one half times as great as that of water. Since the density of the earth's crust is very much less than this, it is not unlikely that the interior of the earth has a density as high as 7 or 8 and that it is composed largely of metals.

Some of the articles which will be useful in this connection are AFRICA, AMERICA, AUSTRALIA, EARTHQUAKE, EUROPE, GEOLOGY, GLACIERS, GRAVITATION, PACIFIC, PLANETS, SUN, TIDES, VOLCANO.

Earthquake, a name given to any very considerable and very sudden disturbance of the earth's crust. Since the late Lord Kelvin showed that the earth is more rigid than steel, it is not surprising that a disturbance at any point in the earth's crust should be propagated rapidly to distant parts of the earth. Concerning the character of the original disturbance very little is known; the slipping of one layer of rock over another and the falling of great masses in the interior of a mountain or volcano have been suggested. But concerning the vibrations which are propagated from one part of the earth to another a great deal has been learned within the last few years by means of the seismograph, an instrument which records both the character and the time of the disturbance at any one point. The principle upon which these seismographs are constructed is simply that of an ordinary gate standing half-way open. If the post to which the gate is hinged be shaken to and fro, the center of gyration of the gate will remain fixed. If now a style be attached to the gate, it will trace out a line on the ground (which moves with the post); and this line will be a description of the displacement perpendicular to the direction of the gate. Now, a typical seismograph contains two open gates with heavy masses at the outer ends, each gate being at right angles to the other so that both components of any horizontal disturbance are obtained. A third heavy mass capable of motion only in a vertical direction records the vertical disturbance. By recording the same disturbance at two different stations it is frequently possible to compute the speed of earthquake-waves. Seismographs are now made of such delicacy that Professor John Milne has succeeded in England in observing earthquakes which had their origin in Japan. The destructiveness of an earthquake is not measured by the amplitude of the disturbance of the particles of the earth at any point but by the speed of these particles. A small to-and-fro motion may be very disastrous if it is rapid; while, on the contrary, a large displacement may be harmless if the motion is very slow. Two of the most disastrous historic earthquakes include one in Sicily, in 1693, which engulfed some 100,000 persons, and one at Yeddo, which proved destructive to 200,000 inhabitants.

Among some of the more important earthquakes of recent times the following may be mentioned:

In 1745 Callao in Peru was destroyed by a severe earthquake, at which time 220 shocks were recorded in 24 hours. A vast tidal wave rose 80 feet and swept over the town. In 1755 occurred the famous Lisbon earthquake. In this case also a great tidal wave was the most disastrous feature. When the wave subsided the city took fire, and within a few hours between 30,000 and 40,000 persons lost their lives. In 1783 Calabria and in 1779 Quito suffered from severe earthquakes, entailing a loss of life exceding 100,000. In 1811 the town of New Madrid, on the lower Mississippi, was terribly shaken, the earth undulating for a distance of 300 miles. Almost at the same time Carácas, in Venezuela, was overthrown and 12,000 of its inhabitants buried beneath the ruins. In 1822 Aleppo, in 1857 Calabria, in 1860 Mendoza in the Argentines and in 1861 Peru and Ecuador were frightfully afflicted. Again, in 1883, the island of Krakatoa in Sunda Strait was visited by a volcanic eruption which cost the lives of more than 35,000. That same year the isle of Ischia near Naples suffered a severe shock, which completely ruined four towns and destroyed 2,800 people. In 1886, on the night of Aug. 31, five destructive shocks were experienced at Charleston, S. C. Crevices were opened several yards in length and a few inches wide, some of which threw out water to a height of several feet.

On the 28th of October, 1891, occurred the great Japanese earthquake. The shocks were felt over almost the whole of the island of Nippon. The principal shock, while lasting only two minutes, was extremely destructive. The volcanic Mt. Haku-San shot out masses of stone and mud. Cracks and fissures opened, and in some places the ground subsided. The top of the sacred Mt. Fujiyama was torn asunder. It is estimated that 6,500 persons were killed, 9,000 injured, and 75,000 houses destroyed. More recent earthquakes are those in 1896 in Japan, involving a loss of 26,000 lives; in 1905 in India, involving a loss of 15,000 lives; the disastrous upheaval at San Francisco, April 19, 1906, followed by the burning of a large section of the city; the partial destruction of Valparaiso, Chile, Aug. 1906, with appalling loss of life and $200,000,000 property destruction; a most destructive earthquake in southern Italy, Dec.28, 1908, when the city of Messina in Sicily was entirely destroyed, Reggio in Calabria and numerous smaller places badly damaged, with a total loss of life of over 76,000. The Kansu earthquake, though in a remote Chinese district, was very destructive; there, on Dec. 1, 1920, between 40,000 and 140,000 people were killed. For the Tokyo-Yokohama earthquake disaster, probably the world's greatest destructive eruption, the damage of which was not fully tabulated for a year following 1923. See JAPAN.

Earthworm, the common angleworm that burrows in the earth. The surface of the body is provided with small bristles which aid in crawling and in burrowing. The body is divided by furrows into a number of rings; those in front are larger than those in the middle and those behind are flatter, so that one can easily tell the head-end and the tail-end. The earthworm, although to general appearances so low in the scale of life, is wonderfully constructed, and is provided with organs of digestion, circulation, nervous life, etc. The digestive system is a muscular tube running through the body, having a crop and gizzard in its course; the front end of it is capable of being thrown out and drawn by a set of muscles. The food consists of animal and vegetable matter mixed with the soil, for example, minute fragments of old leaves, etc. Therefore the earthworm fills its alimentary tube with earth in which are scattered particles of animal and vegetable matter. The food is digested and absorbed into the system, and the earth is voided again. In this way these worms work the soil over, and their influence is greater than one would at first suspect. Darwin showed that in an acre of garden, on an average, as much as fifteen tons of soil would pass through their bodies in a year. They also bring vegetable mould to the surface, and bury objects thrown upon the ground, at the rate of two inches or more in ten years. They have been important agents in burying ancient cities, temples, columns, coins, etc. They also are very beneficial to the soil in loosening it and working it over. They have a set of coiled tubes, a pair in each joint, except the first three or four, that remove from the body the worn-out material, and correspond to the kidneys of higher animals. These organs are characteristic of worms. The nervous system consists of a mass of gray nervous matter in the head, united by strands around the throat to a long cord of nervous matter running along the under surface of the body. The nerve-trunks are connected with this central cord, those of the head-end uniting with the brain, those from the rest of the body with the ventral cord. The earthworms have no eyes, but the entire fore end of the body is sensitive to light. They feed mostly at night, crawling from their burrows, and their places may be discovered by tubular castings of earth. There are many other worms composed, like the earthworms, of a series of rings. It is probable that the parentage of vertebrated animals was from simple animals somewhat like these ringed worms. No one thinks that the worms of to-day represent the ancestors of vertebrates, but it is generally believed by naturalists that the vertebrated animal came from very simple forms many thousand or million years ago, and those early remote parents were probably in structure somewhat like the living ringed worms. See Darwin: *Formation of Vegetable Mould.*

Easter, the festival of the resurrection of Jesus Christ, probably derives its name from Eastre, a Saxon goddess, whose festival was kept about the same time as Easter. In the ancient church, the celebration lasted eight days, but in later times it was limited to two or three days. It was a festival of pleasure; alms were given to the poor and slaves were often freed. Daily services were held during the whole week before Easter, and on Easter Day the people greeted each other with a kiss, saying: "He is risen," to which the reply was made: "He is risen, indeed;" and this custom is still kept up in the Greek church. The custom of exchanging eggs as a symbol of resurrection or renewed life is very old. Easter Day is always the first Sunday after that full moon which comes upon or next after the 21st of March (the beginning of the old church-year), the full moon being understood to be (though not accurately) the 14th of the calendar moon. If the full moon comes on Sunday, Easter Day always is the Sunday after.

Eastern Empire. See Rome and Byzantine Empire.

Eastern Townships. This name is applied to a large portion of southern and eastern Quebec, lying between the American frontier and the older French settlements on the St. Lawrence River. It was populated by United Empire Loyalists after their expulsion and voluntary exile from the United States upon the conclusion of peace with the mother-country in 1783, and forms a distinctively English element in the French province.

East India Company. The East India trade dates from the time when the Portuguese navigator, Vasco da Gama, having effected the eastern passage to India by doubling the Cape of Good Hope, cast anchor off the city of Calicut, May 20, 1498. Though the Portuguese did not start a formal trading-company, they held sway in the seas they had opened during the whole of the 16th century. In the next century their place was rapidly taken by the Dutch, whose first vessel had rounded the Cape in 1596 and whose East India Company was founded in 1602. But the earliest incorporated East India Company was the English, to which Queen Elizabeth granted a charter on the last day of the 16th century. Several later English companies, after a brief period of rivalry, were united with the original company under the title of The United Company of Merchants of England Trading to the East Indies. In the 17th century the Dutch crowded the English out of the islands where all the European powers had gained their first footing, and so settlements were founded by the English on the coasts of the Indian peninsula. Madras, Bombay and Calcutta were founded one after the other. Properly speaking, the company were only merchants exchanging the products of the east and west, but soon they were drawn into the quarrels among the native princes, which resulted in the establishment by England of sovereign powers over vast regions. The charter of this company was renewed again and again, but a feeling against the monopoly gradually grew up in England. In 1833 the company's exclusive trading-privileges were taken away, and from that time the government took a constantly increasing part both in trading and in governing the Indian dominion, though it was nominally done by the company. In 1858, after the Sepoy rebellion, the company was forced after great resistance to yield its powers to the crown; and Indian affairs are now managed by a secretary of state for India. French and Danish East India Companies have existed for short periods. See India; and *India under British Rule*, by J. T. Wheeler.

East Indies, as distinguished from West Indies, include the two great peninsulas of southern Asia and all the neighboring islands from the delta of the Indus to the northern extremity of the Philippines. See India and, for the Dutch East Indies, Holland.

East′ lake, Sir Charles Lock, a celebrated English artist, president of the Royal Academy, was born at Plymouth in 1793, and studied in London and Paris. He lived for some time at Rome, where he painted several pictures which attracted attention in England. In 1841 his great work, *Christ Weeping over Jerusalem*, was painted. He was elected president of the Royal Academy, and was knighted in 1850.

During a journey in search of pictures for the National Gallery, of which he was a director, he died at Pisa, Italy, in 1865. Eastlake gained a high reputation as a writer on art. Besides other works he published *Materials for the History of Oil-Painting* and a number of papers now published in *Contributions to the Literature of the Fine Arts.* See *Memoir* by Lady Eastlake, prefixed to the second series of his *Contributions.*

East Liverpool, O., a growing town in southeastern Ohio, whose trade chiefly consists of pottery-ware. It is in Columbiana County, on the Ohio River, and near the eastern boundary of the state. It lies about equidistant from Wheeling to the south and from Pittsburg, Pa., to the east. It is served by the Cleveland and Pittsburg Railroad. There are over thirty potteries in the town, manufacturing various wares, such as terra-cotta, granite, stone and earthenware, be sides glass-works, foundries and machine-shops. Population, 25,000.

East'on, Penn., county-seat of Northampton County, situated at the meeting of the Lehigh and Delaware Rivers, is 67 miles from Philadelphia and a center of iron, cement and slate industries. Eight railroads and two canals give Easton a large trade. Its industries include the Ingersoll-Rand drill works, textile and knitting mills, brass, bronze, steel, iron and aluminum foundries, piano factories, rope, pump and horse-shoe works. It is widely known as the seat of Lafayette College which received its charter in 1826 and whose Anglo-Saxon and Early English Department is one of the best known in the country. Population, 36,000.

East Orange, N. J., a favorite residential city in Essex County, N. J., for the business men of New York, 12 miles distant. It is served by the Erie and Delaware, Lackawanna and Western railroads. It adjoins Newark to the west. It has, besides a great number of handsome suburban residences, good schools and commodious churches. Its growth has been considerable in the past decade. Population, 65,000.

East Providence, a town in Providence County, R. I., directly opposite the city of Providence, on Seekonk River. The important industries of the town are linen-factories, bleacheries, chemical, electrical and wire-works. The town was incorporated in 1862. East Providence and Seekonk, Mass., once were a part of the town of Rehoboth. Population, 28,000.

East St. Louis, Ill., enjoys with St. Louis, Missouri, a geographical location making it "the hub of the nation" and the second largest railroad center in the United States—27 main lines entering the city. On the opposite bank of the Mississippi River is St. Louis, Missouri, two bridges connecting the cities. The wheels of the city's great and increasing industrial plants are turned by hydro-electrical power from Cahokia, the station there having a capacity of 320,000 kilowats. Machine and car shops, sugar mills, steel plants, shoe and textile factories are among the 200 major industries there. Population, 95,000.

Eaton, Timothy, an eminent merchant of Toronto, Canada. Receiving his education and business training in the north of Ireland, he came to Canada in 1857, and after a brief experience in a country village established himself in Toronto. He was a man of integrity and great energy and personal force were potent factors in his success. He conducted his business on lines of absolute honesty and fairness to his customers, giving value in price and quality of goods, dealt on a cash basis, cut out middle-men and in all respects adopted modern methods. He thus not only built up for himself business reaching from the Atlantic to the Pacific, but also wrought a revolution in the entire retail business of the country. Few men have accomplished as much for the commercial life of Canada as this young immigrant of 1857. The immense business he founded is now successfully continued at Toronto, Winnipeg and other places by his son, John C. Eaton.

Eau Claire, Wis., a city in western central Wisconsin, the capital of Eau Claire County, situated on the Chippewa River at the mouth of the Eau Claire. The two rivers divide the city into three sections. Three lines of railway give facilities to its trade, which is largely of lumber. Its industries embrace, besides iron and linen goods, furniture, shoes, paper-mills, machine-shops, foundries, flour-mills, but lumber is its chief export. It has a number of grain-elevators and saw-mills, sash, door and blind-factories, etc. The city is prominent as a summer resort, and has a public library, a high school, a hospital, banks, newspapers and all the adjuncts of a modern city. Population, 25,000.

Ebert, Friedrich, first President of the German Republic, was born on February 2, 1871, at Heidelberg. He received only a common school education. His father was a tailor. Young Ebert learned the saddler's trade at Heidelberg. In 1893 he was made editor of the *Bremer Burgerzeitung.* In 1900 he was made Workmen's Secretary of the Social-Democratic Party, and in 1905 Member of the Executive Committee of the party. He held local positions from 1900 to 1913. He was elected to the Reichstag, the German Parliament, in 1912 as a Social-Democrat. He was Imperial Chancellor in 1919 and before the end of the year was chosen Imperial President by the German National Assembly in session at Weimar. He was entirely self-educated. Though not brilliant he had the tolerant point of view of the South German character, and had wide influence in Germany. He lost two of his three sons in the World War. As "People's

Plenipotentiary" during November and December, 1919, he probably saved Germany from a dictatorship of the proletariat. He died February 28, 1925, a few months before his term of office expired.

Eb′ony, a species of *Diospyros*, plants of the ebony family. The American representative is the common persimmon (*D. virginiana*). There are 180 species in the tropics and a very few in the temperate regions. Most of the species have valuable hardwood, but it is from certain of the tropical ones that the commerical ebony is obtained. *D. ebenum*, a tree becoming about 50 feet high and growing in the East Indies, is said to yield the best ebony.

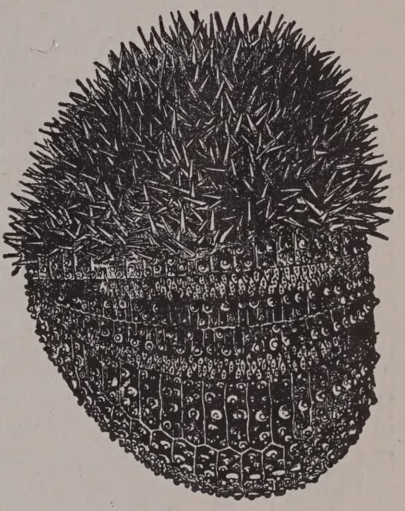
Ebullition. See EVAPORATION.

Ecbatana (*ek-bat′a-nä*), the capital and chief fortress of Media, situated one and a half miles from Mount Orontes and at the foot of a hill crowned with the royal citadel and a magnificent temple of the sun. According to Herodotus, Ecbatana was founded about 700 B. C. and surrounded with seven walls, each higher than the one next outside it The inmost wall inclosed the citadel with the treasury. The city was taken by Cyrus in 550 B. C., and became the chief seat of his government. It was a favorite summer-residence of the Persian kings, and Alexander the Great stayed there for some months in 324 B. C. After his death it became a mere provincial town, but under the Parthians it again became a summer-home of kings. It again sank into insignificance till the Mohammedan period, when the modern city of Hamadan was built on the site of the ancient city. There were six other Asiatic cities to which the name Ecbatana was given by Greek writers.

Ecclesia (*ĕk-klē′zĭ-ȧ*), a popular assembly, especially of Athens, where the people had full sovereignty and at which every citizen of 20 years of age could vote. The Athenian ecclesia held originally four but finally 40 ordinary meetings in the year. The term was also given to the Jewish state, and so came to be used by New Testament writers to mean the church.

Echinodermata (*ē-kī′nō-dẽr′mȧ-tȧ*), the subkingdom of animals; containing starfish, sea-urchins, sea-cucumbers and crinoids. As the name implies, they all have a spiny skin. They are all inhabitants of salt water. The common starfish (see illustration) has five arms radiating from a central disk. At the end of each arm is a little red eye-spot; on the back is a rounded tubercle through which water enters the body; on the lower surface, in the center of the disk, is the mouth; and along the middle of the arms, in grooves, are the tube-feet used in locomotion. Other varieties of starfishes are the brittle stars, the basket-fish, etc. The starfishes form one class of the subkingdom. The sea-urchins form another class. The common sea-urchins are rounded and have a hard, limy, outer case that is covered with numerous spines (see illustration). When the spines are removed, the case is seen to be made of limy plates nicely fitted together. Five sets of these plates, passing like meridians around the shell, are perforated by little holes for the tube-feet, and five other rows of plates are not punctured. Inside the shell is a very complicated structure containing five teeth, the points of the teeth coming to the surface at the mouth; the rest of the apparatus is within the shell. It is often called Aristotle's lantern. Other kinds of sea-urchins are flattened, and are variously called sand-cakes, sand-dollars, etc. Most of the starfishes and sea-urchins move by tube-feet, which are extended by water-pressure from within. A system of tubes, called collectively the water vascular system, carries water over the body. The tubes are arranged as follows: a central tubular ring about the mouth and five radiating tubes leading from it into the arms. From these main tubes smaller ones spring off, right and left, communicating with the tube-feet outside the body and with an equal number of rounded sacs within the body. The water enters through a sieve-like plate on the top of the body, and is carried by a tube to the central vessel around the mouth and then distributed through the rest of the system. The sea-cucumbers form another class. They have a long, plump body shaped like a cucumber, with tube-feet in rows along the body and a tree-like expanse at one end for breathing. The crinoids or feathered stars make another class. They have a body with branching process extending from it, all borne on

STARFISH


SEA-URCHIN

a stem which sometimes is very long. They are dredged from deep-sea waters in various parts of the world. The subkingdom *Echinodermata* is represented by many fossils in the rocks. The true position of the group among animals is not clear; but some of the larvæ of Echinoderms resemble those of worms, and this serves to relate them in a general way with the worms or to indicate that the remote ancestors of both groups were similar. See Romanes: *Jelly-fish, Starfish and Sea-Urchins.*

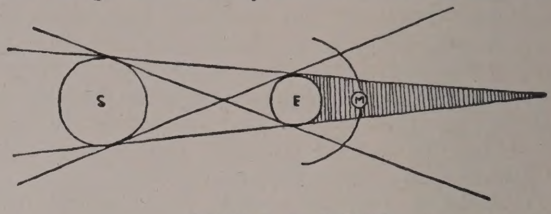
Echo, in Greek fable, a nymph employed by Zeus to keep the attention of his wife, Hera, by talking to her. Hera changed her from a nymph into a mere echo. She next fell in love with Narcissus, and pined away in grief for him, till nothing but her voice was left.

Echo, a phenomenon which is observed when a train of sound-waves strikes a large and fairly smooth body, such as a hillside or the side of a building. The phenomenon is identical in principle with that which occurs when water-waves strike a solid pier and are reflected, or with the reflection which occurs at a fret when waves travel along a guitar-string. Newton employed the echo in a cloister at Trinity College, Cambridge, to measure the speed of sound. Standing at one end of the cloister, he started a group of waves by stamping his foot. These waves were reflected at the far end of the cloister. The interval between the stamping of the foot and the hearing of the echo measures the time necessary for a sound-wave to make one round-trip of the cloister. From this interval and the length of the cloister the speed of sound is directly computed. The most interesting examples of echoes are, possibly, those which occur in the whispering-galleries, such as that in the dome of the Capital at Washington or in the dome of St. Paul's in London. For further details see Tyndall on *Sound.*

Eclipse, in astronomy, is used to describe the passage of one body through the shadow of another. When any portion of the earth's surface passes through the shadow of the moon, the phenomenon is called a solar eclipse. When the moon passes through the shadow of the earth, the phenomenon is called a lunar eclipse. When a satellite passes into the shadow of its planet, we have an eclipse of the satellite corresponding exactly to our lunar eclipse. When, however, the opaque planet or the opaque moon passes between us and the satellite, astronomers call this an occultation.

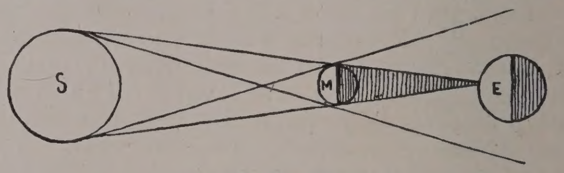
Conditions Necessary for a Solar Eclipse. The plane in which the moon revolves about the earth does not coincide with the plane in which the earth revolves about the sun; consequently there is not an eclipse of the sun once a month, but only when the moon passes through the plane of the earth's motion. Another condition also must be satisfied, viz., the moon must be "new," *i.e.*, must lie in the direction of the sun. Now it happens that these two conditions are met at intervals of about six months; so that we expect about two solar eclipses a year.

The moon and the sun subtend nearly the same angle as seen by an observer at the surface of the earth, so that the moon ordinarily barely suffices to cover the face of the sun. When the moon is in that part of her orbit nearest the earth, her angular size is greater than that of the sun and the eclipse is said to be total; when, however, the moon is in that part of her orbit most distant from the earth, her angular size is diminished, so that the face of the sun is not quite covered. An eclipse of this kind is called an annular eclipse. As was well-known to the ancients, the circumstances of any solar eclipse are repeated almost exactly in a period of 6,585 days and 8 hours (approximately 18 years). The result is that any solar eclipse is repeated every 18 years. This is the period called the *saros.*



LUNAR ECLIPSE

Lunar eclipses are of very little interest from a scientific point of view: but the phenomenon is so striking as always to command popular attention. In the case of the solar eclipse, however, we have our only opportunity to study the solar corona, a magnificent appendage of the sun having a diameter not less than 2,000,000 of miles. Previous to 1869 solar eclipses furnished our only opportunity to study the prominences, great outbursts of incandescent vapors which occur constantly on the surface of the sun. Every total solar eclipse is an event of interest and importance to scientists. Long journeys for purposes of observation are made by expeditions sent out by scientific bodies. Thus valuable data, including photographic records of every phase of the phenomena are secured. For details concerning eclipses see the *American Ephemeris* for two or three years proceding the eclipse. For an excellent account of the entire subject see Young's *General Astronomy.*



SOLAR ECLIPSE

Eclip'tic, in astronomy, the term applied to the apparent path of the sun in the heavens in the course of a year. It is the circle in the celestial sphere to which longitudes and latitudes are referred, and the circle in whose plane eclipses occur, since an eclipse cannot take place unless the moon be in or near the ecliptic. The circle of the sphere is inclined to the equinoctial at an angle of 23° 27′ 5″, and cuts it in two opposite points named the equinoxes. The angle of the inclination of the equator and ecliptic is a variable quantity, and is called the obliquity of the ecliptic. The result of this angle is the change of the seasons.

Ecology (*ē-kŏl'ō-jȳ*), often spelled œcology. In botany it is that division of the subject which deals with plants in relation to their environment. This environment includes both the physical conditions in which plants live and other plants and animals. There are two prominent phases of ecology. One considers the individual plant as it relates its organs to the environment. For example, the relation of leaves to light, of roots to the soil, of flowers to insects; the protection of various organs or the whole plant against drouth, cold, intense light, poor nutrition; the arrangements for the dispersal of spores and seeds; and many other subjects all belong to this phase of ecology. The other phase of the subject deals with plants associated together in what are called plant-societies. Plants are not scattered at haphazard over the surface of the earth, but are organized into definite societies or communities, as a forest-society, a meadow-society, a swamp-society, etc. These societies are determined by varying combinations of numerous factors, such as temperature, water, soil, light, wind, and they are as numerous as the possible combinations of these factors. This study of plant-societies merges into the study of the natural floras of the world, which are combinations of societies; and this in turn leads to the study of geographical botany. The study of the conditions which determine floras is often called floristics; while the combination of plant-societies, floristics and geographical botany is sometimes called phytogeography.

JOHN M. COULTER.

Ecuador (*ek'wă-dōr'*), a republic of South America, lying on the equator and bounded on the west by the Pacific, is thrust like a wedge between Colombia and Peru. It has a seaboard of 400 miles, but its other boundaries are not definitely settled. Its area is about 116,000 square miles, much of it being rich in mineral ores, including gold and silver. The Galapagos Islands also belong to it.

Surface and Drainage. Ecuador consists of three general divisions: the lowlands west of the Andes, the mountainous plateau of the interior and the elevated forest-country to the east. Very little is definitely known about the physical features of the country. The principal mountains either are or have been volcanoes. Many large rivers water it, the most important of which are the large branches of the Amazon.

Climate. The climate is warm but not wholly tropical, altitude neutralizing latitude and the snowline averaging 15,500 feet above tidewater. Cultivation reaches high altitudes, and the plain of Quito, nearly two miles above sealevel, is clothed in luxuriant vegetation. The intermountain regions have a temperate climate resembling perpetual spring. Constant heat and excessive moisture render eastern Ecuador essentially tropical. On the coast the rainy season usually lasts from December to May, but on the Amazon branches it rains nearly all the year round.

Agriculture and Animals. Ecuador is an agricultural country. In the southern regions, adjoining Peru and the Amazon valley, sugar-cane and oranges are cultivated, while in the northern regions, adjoining Colombia, are found wheat, barley, clover and beans. Wild animals of many kinds abound, and the country is the paradise of birds and insects.

Inhabitants and Religion. The whites, who are the landholders and merchants of the country, are hospitable and generally intelligent, but are apt to be lazy. The half-breeds are true savages, while the Christianized Indians are peaceable and contented, though many have sold themselves into slavery. Uncivilized tribes inhabit the country east of the Andes. The state religion is Roman Catholicism. There are many convents, monasteries and seminaries. Education is compulsory, but has not advanced far.

Manufactures and Railroads. Manufactures are limited to timber, coarse cloth, cassava-flour, kerosene and the preparation of spirits from sugar-cane and of flour from the yuca or cassava root. Guayaquil is famous for its hammocks and panama hats. Communication is effected by packmules on bridle paths, coastal steamers, a railroad from Guayaquil to Quito (268 miles) and 125 miles of wagon-road. The chief towns are connected by telegraph, and telephones are used in Quito and in several of the provinces. The exports are mainly coffee, cocoa, vegetable ivory and hides.

Government and Cities. The republic has passed through a series of violent revolutions since its establishment as an independent state in 1831. Under the last constitution there now are a president for four years, a vice-president, a cabinet of four ministers and a cabinet of state, besides a senate and house of representatives. The state is divided into three military districts, containing 17 provinces under governors

Quito, the capital (80,000), has a university and an institute of sciences, and there are universities in Azuay and Guayas. The principal cities are Quito, Guayaquil and Cuenca. The population is 1,400,000. See *Travels in the Wilds of Ecuador*, by Simson, and *Four Years among Spanish-Americans*, by Hassaurek.

Edda (meaning *great-grandmother*), the name of two very different collections of old Scandinavian literature. The Younger or prose Edda was written between 1050 and 1133, and discovered in 1628. The Elder Edda is a collection of songs, mostly Icelandic. These are 39 poems which sing the praises of old Scandinavian gods and heroes. They belong probably to the 8th and 9th centuries.

Eddy, Mary Baker (1821–1910). Discoverer, founder, and leader of Christian Science. She was born at Bow, near Concord, New Hampshire. Her father, Mark Baker, was a large landholder and well-known citizen. Two of her brothers, Colonel George Sullivan Baker and Honorable Albert Baker, were public men of considerable prominence. The names of several of her ancestors figured in early New England history.

As a girl and young woman, Mrs. Eddy showed an unusual interest in religious subjects, which interest was cultivated by her devout and spiritually minded mother. When twelve years old, she experienced a recovery from illness when her mother bade her turn to God in prayer. The Reverend Enoch Courser, a Congregational minister who was Mrs. Eddy's pastor and tutor for six or seven years, beginning when she was fifteen years old, predicted for her a great future, and spoke of her as an intellectual and spiritual genius. She continued as a member of the Congregational Church until she founded the Church of Christ, Scientist. As an author of poems and as a contributor of articles in newspapers and periodicals, Mrs. Eddy was fairly well known in New England before her discovery of Christian Science.

Mrs. Eddy dated her discovery of Christian Science from 1866, at Lynn, Massachusetts, when she recovered, by divine aid, from the effects of a severe injury. She has briefly related this incident as follows:

> "I called for my Bible, and opened it at Matthew ix. 2. As I read, the healing Truth dawned upon my sense; and the result was that I rose, dressed myself, and ever after was in better health than I had before enjoyed. That short experience included a glimpse of the great fact that I have since tried to make plain to others, namely, Life in and of Spirit; this Life being the sole reality of existence." (Miscellaneous Writings, p. 24).

In her autobiography, "Retrospection and Introspection," Mrs. Eddy has more fully related this incident, together with prior and subsequent experiences.

From 1866, Mrs. Eddy devoted herself entirely to the mission she felt she had as the discoverer, founder and leader of Christian Science. She issued the Christian Science textbook, "Science and Health with Key to the Scriptures," in 1875. She founded the Church of Christ, Scientist, in 1879. She established the first Christian Science periodical, The Christian Science Journal, in 1883. Among the last of her important acts, she founded a daily newspaper of international character, The Christian Science Monitor, in 1908. Other books by Mrs. Eddy are "People's Idea of God" (1886); "Christian Healing" (1886); "Retrospection and Introspection" (1891); "Unity of Good" (1891); "Rudimental Divine Science" (1891); "No and Yes" (1891); Church Manual (1895–1910); "Miscellaneous Writings" (1896); "Christ and Christmas" (1897); "Christian Science versus Pantheism" (1898); "Pulpit and Press" (1898); "Messages to The Mother Church" (1900; 1901; 1902); "The First Church of Christ, Scientist, and Miscellany" (1913). Consult "Life of Mary Baker Eddy," by Sibyl Wilbur.

E'den, the name of the district situated in paradise. It lay in the east in the highlands of Central Asia. Many efforts have been made to discover just where Eden was, but scholars do not at all agree as to its precise location. The Aryan races, as well as the Hebrews, believed that the human race had its origin in the mountains of Central Asia.

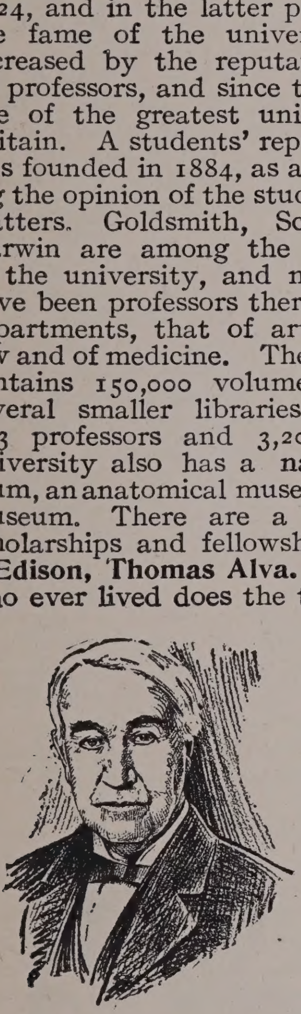
Edgeworth, Maria, English novelist, was born in Oxfordshire, Jan. 1, 1767, and died near Longford, Ireland, May 22, 1849. She began to write fiction early in the 19th century, though she had previously taken an interest, with her father, in educational topics. Her chief stories, which treat mainly of the virtues and vices of humanity and have high moral aim, embrace *Popular Tales*, *Moral Tales*, *Castle Rackrent*, *Belinda Ormond*, *Tales of Fashionable Life* and an *Essay on Irish Bulls*.

Edict of Nantes. See HUGUENOTS.

Ed'inburgh, the capital of Scotland. It stands about two miles from the sea on a series of ridges, and is overlooked by Arthur's Seat and other hills. Arthur's Seat is a picturesque hill in Queen's Park, near the city, and its name is supposed to go back to King Arthur's time. It rises 822 feet above sealevel, and gives a view of great extent and wonderful beauty. Of the hills within the city the most important is Castle Rock. In the beginning of the 7th century Edinburgh is mentioned as the capital of the kingdom of Northumbria, and named after its king, Edwin. The city was made a borough by Robert Bruce, who also gave it the right to establish a port at Leith, two miles away. During the 15th century it began to be recognized as the capital of Scotland, and Parliament regularly met there. In 1544 the city was burned by the English. In 1561 Queen Mary came back from France, and the tragedy of her short reign was acted almost entirely in Edinburgh. It was at Holyrood Palace that Rizzio was killed; in Kirk-of-Field, near where the university now stands, Darnley was murdered; and in the chapel of Holyrood Mary was married to Bothwell. The union of England and Scotland, in 1707, drew away the Scottish nobility from Edinburgh, but the Pretender was welcomed there for a short time in 1745. Since then the city has spread far beyond its ancient walls, and has become famous as a center of scientific and literary activity. Its many fine buildings and picturesque situation, extending up the hills which lie outside the old town, make Edinburgh one of the most beautiful cities of Europe. It is still representative of the capital of Scotland. It is the seat of the law-courts and of some of the departments of government. It is the center of much of the intellectual life of the northern kingdom, and it has long been known for its educational institutions. It is not a manufacturing town to any great extent, its most important industries being brewing and publishing. It returns four members to Parliament. Population, 320,239. See *Old Edinburgh*, by Drummond and *Old and New Edinburgh*, by Grant.

Edinburgh University took its origin from the zeal of the Reformers for education. In 1583 the college was opened. In the 18th century it began to grow. The beginning of a medical college was made in 1724, and in the latter part of the century the fame of the university was greatly increased by the reputation of several of its professors, and since then it has become one of the greatest universities in Great Britain. A students' representative council was founded in 1884, as a means of expressing the opinion of the students on university matters. Goldsmith, Scott, Carlyle and Darwin are among the eminent students of the university, and many learned men have been professors there. There are four departments, that of arts, of divinity, of law and of medicine. The university-library contains 150,000 volumes, and there are several smaller libraries besides. It has 133 professors and 3,200 students. The university also has a natural-history museum, an anatomical museum and a botanical museum. There are a large number of scholarships and fellowships.

Edison, Thomas Alva. To no other man who ever lived does the term “born inventor” apply so aptly as to the “Wizard of Menlo Park.” Watt and Morse achieved invention by years of patient scientific investigation; Arkwright and Whitney had invention thrust upon them by circumstances; Fulton was an inventor by natural gift, but followed the profession of an artist up to the age of 40. But Edison lived and breathed in the atmosphere of creation from early boyhood, jeopardized his scant living for the pure joy of doing his own work, and was known as the boy-wonder in electricity on Wall Street, New York, soon after he cast his first ballot. It has been said of him that he “kept the path to the patent-office hot with his foot-steps.”



THOMAS ALVA EDISON

The thing that impresses the reader of a life of Edison, first and last, is its joyousness. From babyhood he was the busiest, happiest, most intensely interested in life of any boy in the village of Milan, Ohio, where he was born on February 11, 1847. His father made shingles by hand, and Alva, as he was then called, haunted the shop. But he found the docks along the canal more dramatic, for sometimes as many as five hundred wagon-loads of wheat and corn would be brought in by farmers in one day and loaded on the grain-boats. He watched everything with his big gray eyes, and was not slow about asking questions. A sturdy little “sobersides,” his mother called him, too busy to play much with other boys. At home he was a voracious reader, and when the family moved to Port Huron, Michigan, he set himself seriously to work to reading all the books in the public library, a task he wisely abandoned. At 12 he became a business man, and had marked success as a train boy. He sold more newspapers, books and fruit than the other boys, and still had time to print a little newspaper and start a laboratory in one end of the smoking-car. In saving the life of a station-agent's baby he won a friend who taught him the trade of telegraph-operator. He soon became skilful in sending and taking messages, but he had to know how the instrument worked and why, and experimented with an old battery in his father's cellar until he understood it.

At 15 Edison was in charge of the station at Stratford, Canada, where he was so busy doing his own work that he very nearly caused a wreck on the road and won his discharge. It must be said that he never worked well under orders. He lost positions by his inattention to duty almost as fast as he gained them by ability. His first invention was of a repeater, that would take down the dots and dashes as they came rushing over the wire, and repeat them as slowly as necessary for the operator to write out at his leisure. Then he began to experiment on the problem of sending more than one message at a time over the same wire. He dressed shabbily, and spent all he earned on books and apparatus. He was thought to be an impractical, dreamy fellow, and his employers were often impatient. Thus for five years he led a wandering life, often out of work that would bring in money, but working hard on his own ideas and leading a clean, straight life of the intellect. Pleasures never tempted him. His idea of fun was to be so absorbed that he didn't know if it were night or day. “I owe my success,” he has often said, “to the fact that I never had a clock in my workroom.”

At 21 Edison went to Boston, a rapid operator. In another year he was in New York, when accident led him to repairing a ticker in a broker's office and to a salary of $300 a month. Then he invented an improved apparatus for which he got $40,000. The Western Union took an option on his future inventions, and the young genius started a factory in Newark, New Jersey, with 300 employes. It was the most remarkable establishment in the world, where everybody worked from sheer enthusiasm, with irregular hours and no book-keeper. But Edison literally coined his inventive brain into money. He had 50 inventions at various stages at one time, wired instructions to his patent-attorney every day, and cabled applications for patents to London. Before he was 30 the factory was sold, and Edison built the laboratory at Menlo Park to devote his time entirely to invention. There he worked out the problems of the telephone, the incandescent electric light, the phonograph and other great discoveries

Ah, what a workshop that was! One hundred feet long it was, with a maze of wheels and flying belts, lathes, drills, planers and milling-machines.

HIS METHOD OF WORKING.

Above were a chemical laboratory and a library; and skilled workmen and scholarly experimenters, a private secretary and even a book-keeper. A big workshop and a small house suited Edison exactly. He went about in shabby work-clothes and acid-stained hands. Most of the time his wife and children dined alone, for the Wizard was never to be disturbed. He ate when he was hungry and rested when he was tired and had as much fun in his work as a boy at a ball game.

Not all of his inventions were made easily. Some he worked on for years and spent thousands of dollars in perfecting. One rule he has always kept: "Be sure a thing is needed or wanted, then go ahead." The phonograph, telephone transmitter, electric light and power system, megaphone, quadruplex, tasimeter for measuring the heat of the stars, kinetoscope, anyone of a dozen big inventions would have won fame for the man, but they are not usually identified as belonging to him in the multitude that bear his name. The electric light made him rich, but cost him years and vast expense to perfect. Men were sent around the world to find material for the filament.

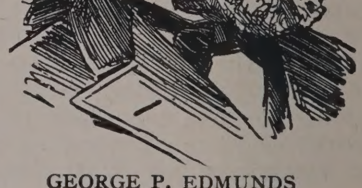
THE FIRST ELECTRIC LIGHT.

It was in 1880 that Menlo Park was first illuminated with the electric light. Special trains were run out for the event from New York City, and there was as much excitement as when the first steamboat was launched on the Hudson. In 1886 Menlo Park was outgrown, and an immense plant built at Orange, New Jersey. Wealth and fame, however, did not bring him leisure. His highest pleasure was in his work, and he gave the world his best in his inventions. He was awarded many honors by a grateful world. France made him a Chevalier and later a Commander of the Legion of Honor. In 1915 he refused the Nobel Prize in Physics. In 1927 he became a member of the National Academy of Sciences. In 1929 the civilized world united to honor him in the celebration of Light's Golden Jubilee, the fiftieth anniversary of his invention of the incandescent electric lamp. In his later years he devoted much time to developing a plant, the golden rod, which would grow in the United States and from which rubber could be extracted. He died October 18, 1931.

Edmonton, the capital of Alberta, population 16,000, on the Saskatchewan River, is 180 miles north of Calgary. Valuable coal-fields surround it. The trade of the great Mackenzie basin is attracted to it. It is the center of an immense and rich agricultural tract, and was an important point in connection with the fur-trade. In early days it was a point of departure on the Edmonton route for the Klondike. A railway-center, served alike by the Canadian Northern, the Canadian Pacific and the Grand Trunk Pacific, Edmonton is growing rapidly and promises to be a considerable city.

Ed'mund, for his bravery surnamed Ironside, king of England for seven months in 1016, was son of Ethelred the Unready and half-brother of Edward the Confessor. He is said to have been born in 989. He was chosen king by the Londoners, while Canute was chosen by the *witan* or council. Edmund entered the struggle with great energy. He gathered an army and defeated Canute in two hard-fought battles. He then raised the siege of London, and again was defeated in Essex, and this forced him to agree with Canute to a division of the kingdom, Canute taking the north side, while Edmund took the south. It also was agreed that, in case one of the kings should die, the other should become king of the whole of England. A few weeks after this agreement Edmund was murdered in 1016.

Edmunds, George Franklin, an American statesman, was born at Richmond, Vermont, Feb. 1, 1828. He was admitted to the bar in 1849, and sat in the state legislature from 1854 to 1859 and in the state senate from 1861 to 1862. In 1866 he was elected to the senate of the United States, where he served on many important committees, and was president *pro tempore*



GEORGE P. EDMUNDS

after Mr. Arthur became president. He took an active part in the prosecution of President Johnson, and was one of the electoral commissioners appointed in 1877 to decide upon questions connected with the counting of the electoral vote of the disputed presidential election of the previous year. He was the author of the acts of 1882 and 1887 for the suppression of polygamy in Utah. In 1891 he withdrew from political life. He was noted for legal knowledge. He died in 1919.

E'dom or **Idumea,** a name given to the whole country extending from the Dead Sea southward to the Gulf of Akabah. It was about 100 miles long from north to south. The mountains are steep, bare masses of chalk and porphyry. The Edomites were recognized by the Israelites as a closely connected race, being the descendants of Esau, the brother of Jacob. Their religion was a belief in many gods. They were conquered by Saul and subdued by David, and were subject to Judah until the reign of Joram. They regained independence under Ahaz, and after the fall of Judah became masters of southern Palestine and Hebron, but were completely subdued about 126 B C. From that time the western part (Idumea) was held by Jewish governors, one of whom, Antipater, became procurator of all Judæa in 47 B. C. His son, Herod the Great, founded the last Jewish dynasty. After the destruction of Jerusalem (70 A. D.) the country was merged in Arabia Petræa, and the name of Idumea disappears from history. See *The Desert of the Exodus* by Palmer.

Education, History of. A liberal professional preparation for teaching is hardly possible without a comparative study of educational progress as shown in past and present educational systems. It may take either of two general forms: that of education as a whole or that of formal pedagogy in particular. If the former, the field includes a history of the growth of all branches of learning and of the various institutions of civilization in general; if the latter, it is limited to the development of educational doctrine and the growth of systems and methods. There are commonly recognized five great epochs in educational history: the Oriental, the Classical, Christian before the Reformation, the Reformation and the Modern Epoch. Each epoch is rich in instructive material, throwing light upon nearly every problem which the teacher meets and helping him to a more comprehensive view of the methods by which they may be solved.

The following are among the most commonly used texts on this subject: Compayre, Painter, Seeley and Williams. See also Boone's *Education in the United States,* Swett's *American Public Schools,* Klem's *European Schools,* Quick's *Educational Reformers,* Laurie's *Rise and Early Constitution of Universities,* Lang's *Great Teachers of Four Centuries* and the histories of education in the different states of the Union, published by the bureau of education. Among these texts one of the oldest and perhaps the most interesting is Quick's *Educational Reformers.* A more recent and comprehensive work is Paul Monroe's *History of Education.* This is a volume of nearly 800 pages, and is an extremely valuable work. The substance of this is now available, also, in a volume of a little over half the size, suitable for beginning students. The title is *A Brief Course in the History of Education*

Education, Modern. Perhaps no phase of social activity has undergone so radical a development in modern times as that of education. This evolution may be outlined under the headings of aim, subject-matter, method and organization of education. In regard to aim, four points may be noted. First: The ideal has come to be more and more progressive. Education no longer regards itself as confined to the task of fitting the child to live contentedly the life of the parent, but consciously labors to inspire the young to strive for better conditions and to prepare them to attain these. Second: Education no longer, as in ancient times, aims to train the individual merely in the interest of society nor, as in medieval and comparatively modern times, for individual culture or development, but rather for what may be called social efficiency. Third: Such an aim includes not only the religious, ethical and cultural training toward which attention was formerly almost solely directed in the education of the school, but vocational training, whether along professional or industrial lines, and such political training as fits for citizenship in those advanced nations where self-government prevails. Fourth: All this involves the extension of education to all classes, so that no general phase of culture is peculiar to any social order.

The subject of education has been affected by all of these modifications in aim. Science, history and modern literature have been added to mathematics, theology and the classics. In general the curriculum has been enriched by subjects giving interesting or valuable subject-matter, and the disciplinary subjects have been reduced in importance. The elementary school has developed geography, nature study, literature, manual training and art in addition to the three "Rs." The subject-matter of the various vocations, from engineering to medicine, has been organized and taught.

In method the most important reform is due to the growth of the now well-established belief that mastery of method is quite as important to the teacher as knowledge of subject-matter. Psychology has been appealed to as a source from which correct method should be derived. In general, mechanical memory-work has been replaced by such as appeals to reason and stirs interest and spontaneity. The inductive method, involving the idea of development lessons (see METHOD OF TEACHING), library-methods, laboratories, workshops, illustrations, all rouse self-activity (q.v.), excite interest (q.v.), involve the constant application of what is learned, and aid in producing a progressive, alert and adaptable rather than a mechanical and passive character. The idea of formal mental discipline (q.v.) has been discredited by psychology, and more and more abandoned for that of discipline through valuable and interesting subject-matter. The course of study has been organized to appeal more to the powers, instincts and interests of the child at various stages in his development. Finally, trained psychologists have been to some extent employed in connection with school-systems.

In organization the most marked advances of modern times have been the development of state-systems of popular education (practically the creation of the 19th century), the transfer to a large extent of education from church or private control to that of the state, the expenditure of enormously greater funds for educational purposes, the development of supervision, very close in the advanced states of Europe, professional training for teachers, the differentiation of schools according to the aim of the instruction, and the better organization and unification of national systems. In all these directions an enormous amount remains to be done.

See APPERCEPTION, CORRELATION, CHILD STUDY, INTEREST, METHOD IN TEACHING, MENTAL DISCIPLINE, PSYCHOLOGY FOR TEACHERS. SELF-ACTIVITY and SCHOOLS, ELEMENTARY. Consult *Text-Book in the History of Education*, Monroe.

Education, State-Aid in. In the United States, education is one of the matters which falls within the control of the several states, and not of the Federal government. The result of the power lodged in the states is that they tend to give aid in money and land to the schools; while, in return, their control over the schools increases, and the educational system in this way becomes more uniform. Thirty of the states make the education of children compulsory for an average term of five years. Most cities have their own superintendents of public instruction, and their own school-systems under a charter from the state. Each state, however, has a superintendent of public instruction who is given this title in 29 of the states, other titles in others. One of the benefits of state-control in education is that the more prosperous sections help to improve the schools of less prosperous places. The state generally supports normal schools for the training of teachers. In the west and south the states go so far as tc support universities, which is done nowhere else in the world to anything like the same extent. Secondary education often receives special attention from the state. Massachusetts requires the townships to maintain secondary schools. The University of the State of New York, however, is the best example of how the state may organize secondary education. The regents examine the high-schools, and allot vast sums in their aid. In Indiana, Minnesota and other western states the state-board of education accredits high-schools, which may then send their graduates direct to the state-university without examination. Each state admitted to the Union since 1800 has ceded land for a state-university and for common-schools. In 1836 many of the states distributed the surplus revenue that was returned to them by Congress wholly or partly among the schools. Of the land-grants for education made by the states, the chief is the 16th section of each township and, in states admitted since 1848, the 36th section also. In all, the states have granted about 68,000,000 acres of land; and to this they have added vast grants also in money.

Ed′ward, surnamed the Confessor, the last Anglo-Saxon king of the old royal line, was the elder son of Ethelred the Unready. On the deaths of Ethelred and Edmund Ironside, in 1016, Canute obtained possession of the throne and married the wife of Ethelred. Until Canute's death, in 1035, Edward lived in Normandy, but in 1042 he succeeded his half-brother, Hardicanute, as king. He was continually under the influence of favorites, who usually were foreigners; and the history of his reign is a record of the struggle between the Norman or court party and the old Anglo-Saxon party under Earl Godwin and his son Harold. Edward also carried on wars with the Welsh. He died on Jan. 5, 1066. He was canonized in 1161 by Pope Alexander III. With him the old English monarchy perished, save for the few months of the energetic rule of his successor, Harold II.

Edward I, king of England, the elder of the two sons of Henry III, was born at Westminster, June 17, 1239. At the parliament of Oxford (1258) he took part with his father in his contest with the nobles, but later seems to have sided with Earl Simon de Montfort, the leader of the barons or national party, but soon joined his father again. It was his rash eagerness which lost the battle of Lewes (1264), in consequence of which he was imprisoned as a hostage for his father's pledges. He made his escape soon after and gained the battle of Evesham (1265), which ended the great struggle between the king and the barons by the death of Earl Simon on the field. In 1270 Edward set out on a crusade, and two years later barely saved himself by his great strength from being murdered by one of the infamous sect of the Assassins. While he was still absent, his father died, and Edward was proclaimed king, but did not reach England till nearly two years after. He at once began that policy of reform which has given him the name of the English Justinian, and made his reign almost the most important period in the constitutional history of England. His first war was with the Welsh, and ended in the complete subduing of that nation at the defeat and death of Prince Llewellyn and the execution of Prince David as a traitor in 1283. In 1290 he banished all the Jews from the kingdom, to the number of over 16,000, on the charge of excessive usury. About the same time the contest for the Scottish crown gave Edward a chance to assert the old claim of the English crown to the over-lordship of Scotland. He decided the contest in favor of John Balliol, who swore homage to him for the whole of Scotland. Meanwhile a war with France was threatening, and Edward called together an assembly which was practically the beginning of the modern English parliament. Balliol soon found his position as a vassal-king intolerable, and open war broke out in 1296. Edward marched north, forced Balliol to surrender, and subdued the kingdom in five months. Then he sailed to Flanders to carry on the French war; but, in order to make peace with his nobles at home, he confirmed the Great Charter and added other clauses, thus finally establishing the right of the people themselves to determine their own taxation. As a landmark in the history of England, this is second only to *Magna Charta* itself. Affairs in Scotland soon compelled his return from Flanders. Wallace had collected a large force, and completely defeated an English army at Stirling (1297). Edward, however, defeated Wallace at Falkirk, and afterwards (1305) executed him as a traitor. He then prepared a new constitution for the conquered kingdom, and made arrangements for the representation of the Scots in the English parliament, a measure which, had it been successful, would have joined England and Scotland together four centuries before the union took place. But, before long, Robert Bruce raised a revolt, murdered the regent, Comyn, and was crowned king (1306). Edward at once set out against him, but died on the way, in July, 1307, at Burgh-on-Sands, near Carlisle, leaving his son Edward the command not to bury his body till he had utterly conquered the Scots. The people loved him dearly. See *The Early Plantagenets*, by Stubbs, in *Epochs of Modern History*.

Edward II, son of the preceding, was born in Wales, April 25, 1284, and created Prince of Wales in 1301, being the first heir to the English throne who bore that title. He accompanied his father on his last expedition to Scotland, but, instead of carrying out his dying command, he returned to London and gave himself up to pleasure. He came to the throne in 1307, but always was under the influence of favorites. The first of these was a Gascon, Piers de Gaveston, whom he left as guardian of the kingdom while he went to France to marry Isabella, the daughter of Philip V. The nobles demanded the banishment of Gaveston, and twice he was forced to leave the kingdom, being finally executed by the nobles in 1312. Two years later Edward invaded Scotland at the head of 100,000 men, but suffered a terrible defeat by Robert Bruce at Bannockburn, which secured the independence of Scotland. In 1321, with the aid of his new favorite, Hugh le Despenser, and his son, Edward overthrew and put to death his minister, Lancaster, who had controlled him for some years. He then sent Isabella, his wife, to France to treat with her brother, the French king, about a quarrel which had arisen between the two countries. Isabella despised her husband and hated the Despensers, and so joined several of the discontented nobles in a conspiracy against Edward. She landed in Suffolk with a force in September, 1326, captured the king and cast him into prison. The Despensers were executed, and Edward was compelled to resign the crown. He was murdered at Berkeley Castle a few months later, in 1327.

Edward III, son of the preceding, was born at Windsor in 1312, and was crowned king, Jan. 29, 1327. During his childhood the country was governed nominally by a council of nobles, but really by Roger Mortimer and Queen Isabella. In 1330 Edward seized Mortimer and put him to death, and sent away his unworthy mother. He then invaded Scotland to help Edward Balliol, son of John Balliol, who had secured the crown. He defeated the Scots at Halidon Hill (1333), and made Balliol do homage to him. As a warrior, Edward's greatest exploits were in France. He laid claim to the French throne and made war on Philip VI. This was the beginning of the Hundred Years' War. His claim, through his mother, a sister of Charles IV, was groundless; but, nevertheless, he carried on the contest with great vigor. He laid heavy taxes on the people in order to raise money for the war, and was obliged to grant many valuable privileges, especially to the nobles. Accompanied by his eldest son, called the Black Prince, he conquered a great part of Normandy and gave the French a terrible defeat at the famous battle of Crécy (1346), where the Black Prince, though but 16, showed the greatest courage. The city of Calais was taken after a siege of 12 months, and the six burgesses who offered themselves to the king, as a sacrifice for the safety of the rest of the citizens, were saved from the king's wrath only by the entreaty of the good Queen Philippa. Meanwhile the Scots had been severely defeated at Neville's Cross (1346) and their king, David II, taken prisoner; while in 1349 the Black Death had carried off a third of the population of England and permanently changed the relations between master and laborer. After a long truce the French war began again in 1355, and next year the Black Prince won the victory of Poictiers, where the French king, John, was captured. The Black Prince was given Aquitaine and Gascony by his father, and before long got himself and King Edward into another war with France, which was disastrous to England. In spite of all his brilliant victories and the bravery of his son, Edward was unsuccessful in his wars. Affairs at home were in a bad condition; he quarreled with his parliaments, gave himself up to the influence of his mistress, and let his government slip into the hands of his third son, John of Gaunt. The Black Prince, who had headed a party opposed to his father, died in 1376, and the following year the king himself died, after a reign of over 50 years. See *Edward III*, by Warburton, in *Epochs of Modern History*.

Edward IV, son of Richard, duke of York, was born at Rouen in 1441. It was the period of the struggles between the two great houses of York and Lancaster. Upon the death of his father at the battle of Wakefield in 1460, Edward found himself at the head of the Yorkist party. He soon gained the battle of Mortimer's Cross, and, though the Earl of Warwick a few days later lost him the second battle of St. Albans, he entered London in triumph and was hailed as king. Soon after, he gained the great battle of Towton, which seated him on the throne (1461). Margaret, the queen of Henry VI, kept up the struggle in the north, but the capture of the weak and unhappy Henry VI put an end to her hopes. Edward quickly became popular because of his frank manners and handsome figure; but his marriage with Elizabeth Grey, daughter of the Lancastrian, Lord Rivers, and the raising of her relations to power displeased the Earl of Warwick, who was the king's most powerful minister. Warwick entered ino a conspiracy against him and tried to bring back the Lancaster party to power, but was defeated and killed in the battle at Barnet in 1471; and the war was ended by the defeat of Queen Margaret at the battle of Tewkesbury. Edward showed the cruelty of his nature by the murder of Margaret's young son after the battle and the severity of his vengeance on other captives. (The murder is now credited to Richard, afterward Richard III). The death, in the Tower of London, of the old king, Henry VI, made Edward feel secure on the throne. He practically stopped the calling of parliaments, and got the money he needed by taking forced loans from wealthy men and by carrying on trade by means of his merchant-vessels. He died in 1483, worn out by his evil life. See *Houses of Lancaster and York*, by Dr. James Gairdner, in *Epochs of Modern History*, and Green's *History of the English People*.

Edward V, son of the preceding, was born in 1470. At the death of his father he was a boy of 13. His uncle, Richard of Gloucester, managed to get himself appointed protector of the kingdom, and shut up the young Edward and his little brother in the Tower. They were never heard of again, but there is much doubt that they were murdered by the order of their uncle, who had himself crowned king in the same year. (Later historians charge Henry VII with these murders). Nearly 200 years later some bones were found in an old chest and, being supposed to be the remains of the unfortunate princes, were buried in Westminster Abbey.

Edward VI, born on Oct. 12, 1537, was the son of Henry VIII, by his third queen, Jane Seymour. He was taught by such learned men as Roger Ascham, and in January, 1547, he succeeded his father as king, his uncle, afterward Duke of Somerset, having been made protector. Somerset invaded Scotland to try to compel the marriage of Edward and Mary, Queen of Scots. He gained the battle of Pinkie, but had to return home because of the intrigues of his brother, Earl Seymour, whom he executed. Two rebellions, one of the Catholics and the other of discontented laborers, were put down; but by the intrigues of Dudley, Earl of Warwick, Somerset was accused of treason and beheaded. Dudley (now become Duke of Northumberland) then married his son to Lady Jane Grey and induced Edward, who was dying, to make her his successor on the throne. The king lived only a short time after, dying in July, 1553, as some thought, of poison. Under Edward the Catholics were greatly persecuted by the Protestant leaders. See *Literary Remains of Edward VI*, by J. G. Nichols.

Edward VII, king of Great Britain and Ireland and Emperor of India (long known as Albert Edward, Prince of Wales), was born on Nov. 9, 1841, at Buckingham Palace, London, the eldest son of the late Queen Victoria, whom he succeeded on the throne, Jan. 22, 1901. In 1863 he married Princess Alexandra of Denmark, eldest daughter of King Christian IX, and before his accession he was continually before the British public as the most active member of the English royal family, figuring at innumerable court and civic functions at home and abroad, besides visiting foreign countries and in numberless ways doing unwearied work in his high station for the crown and the nation. Among all ranks of the British people Edward VII was a favorite, and after his accession to the throne his course was marked by tact and judgment as well as by conscientious principle, as king and ruler. King Edward was uncle to Emperor William of Germany and to the present Emperor of Russia and also brother-in-law of the King of Greece. He was crowned on Aug. 9, 1902. His living children are George, who was Prince of Wales and is now King George V, who in 1893 married Victoria Mary, daughter of the Duke of Teck; Louise, Princess Royal, who in 1899 married the Duke of Fife; Princess Victoria Alexandra; and Princess Maude Charlotte, who in 1896 married Prince Karl of Denmark, now King Haakon VII of Norway. His only living brother is Prince Arthur, Duke of Connaught; while his sisters are Princess Helena, Princess Louise and Princess Beatrice. He died May 6, 1910.

EDWARD VII

Edward the Black Prince. See EDWARD III.

Edwards, Amelia Blandford, English novelist and Egyptologist, was born at London in 1831, and died in Somersetshire, April 15, 1892. In the fifties she began to write fiction, her principal novels being *My Brother's Wife*, *Hand and Glove*, *Barbara's History*, *Half a Million of Money*, *Denham's Vow*, *Lord Brackenbury* and *In the Days of My Youth.* Later in life she traveled extensively, and took a great interest in Egyptian exploration. The fruit of these activities appeared in the following books: a work dealing with the Tyrol, entitled *Untrodden Peaks and Unfrequented Valleys;* an account of some discoveries in the Nile valley, entitled *A Thousand Miles Up the Nile;* and a work on Egyptian archæology and history, entitled *Pharaohs, Fellahin and Explorers* (1891).

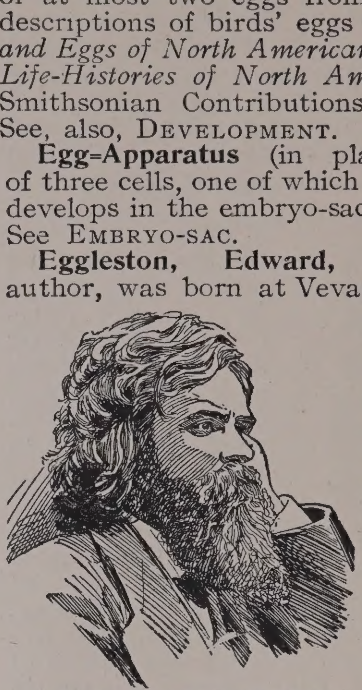
Edwards, Jonathan, theologian and philosopher, was born at East Windsor, Conn., Oct. 5, 1703. He early showed a decided taste for learning, and graduated at Yale College in 1720. After acting as a tutor at Yale for a few years, he was ordained to the ministry at Northampton, Mass., where he remained for many years. A dispute with his church led to his resignation in 1750. He next labored some years as a missionary to the Housatonic Indians, at Stockbridge, Massachusetts, until 1758, when he was called to succeed his son-in-law, President Burr, as president of Princeton College, but died of smallpox a month later, March 22, 1758. He has been justly styled the prose Dante of America. Edwards is still America's most original thinker in philosophy, and it is not likely that his treatise on the *Freedom of the Will* will ever be set aside. He was a rigid Calvinist in theology, and his character was one of rare goodness. His description of Sarah Pierrepont, whom he married, is exquisite in spirit, and is a gem of literature. His influence on the thought of New England was large, and many of the greatest American thinkers of the generation which followed him were his pupils. See *Life*, by S. Edwards Dwight; and *Life*, by A. V. G. Allen.

Eel, a bony fish of elongated snake-like form. The eels are found in nearly all waters, both fresh and salt. In the United States they are in all streams of the eastern slope of the continent that connect with salt water. The young ones ascend streams, while the old ones descend the rivers at the breeding-period to lay their eggs on the mud-flats at the mouths of the streams. The discovery of their eggs is recent. In ascending streams they swim through rapids and over dams, but are stopped by large falls and, therefore, there originally were no eels in the Great Lakes above Niagara. They also were lacking in the streams of the Pacific slope. They have no ventral fins, but are powerful and rapid swimmers. They eat fishes, shrimps, crayfish, etc., overturning stones and thrusting their sharp noses into holes and nooks in search of food. They also lie beneath logs or in the mud, and dart out at their victims. They are active at night. They are eaten as food by many people. The common fresh-water eel attains a length of three feet; the conger-eel reaches six feet and more in length. It does not ascend streams like the others. The electric eel is another type.

Eg'bert, king of Wessex, ascended the throne of that country in 802. England at that time was divided into the three kingdoms of Northumbria, Mercia and Wessex. After a struggle with the Mercians, Egbert was recognized as overlord of that kingdom, and not long after Northumbria also accepted him as its overlord. Thus he became the first real king of England, although he did not formally assume that title, and continued to govern Mercia by means of its own king. He died in 837.

Egg, the starting-point of all animal life except the single-celled animals. The latter are produced by division of the body into two similar cells. Eggs begin with the sponges, and occur in all animals above them. The egg is formed within the ovary or egg-producing organ, and in reality is, a modified cell (see CELL-DOCTRINE) of the ovary. The size of eggs depends on the quantity of food-yolk; for example, the hen's egg is large, because there is much food-yolk in it; frog's and toad's eggs are smaller; and eggs of the starfish are smaller still. The egg is fertilized, and thereafter undergoes development. Insects lay eggs on plant-stems, leaves, bark and other places. Crabs carry their eggs attached to their bodies, spiders lay eggs in cocoons, snails and other mollusks in cases. Many worms lay eggs in capsules. Fishes lay a prodigious number of eggs; for example, a single white-fish will lay upward of 50,000. Frog's eggs are held together in a mass by a jelly-like substance. Toad's eggs are laid in strings. The eggs of snakes, turtles and alligators are laid singly and are surrounded by a leathery shell. They are usually left to be hatched by the heat of the sun. The lowest mammals, like the duck-moles of Australia, are egg-layers. In all the higher mammals the eggs, when undergoing development, are retained within the body. They are very small, because, as the nourishment is supplied by the parent, there is no need of food-yolk. Bird's eggs are of interest to collectors. The largest eggs of living birds are those of the ostrich, which are about six inches in their longest diameter, but there are preserved in museums of Europe some eggs of a gigantic extinct bird of Madagascar, which measured nearly three feet in largest circumference and would hold about two gallons. The wisdom of nature is shown in adapting the shape of the eggs of certain birds to the kind and place of the nest. In case of birds which lay their eggs on bare rocks or ground with little or no attempt at building a nest, the eggs are generally large and round at one end and pointed at the other; they are thus turned around by the wind and not blown away as would be the case if they were of more regular oval shape. Similar adaptation is found in the colors of eggs. The whippoorwill's eggs are laid on a bed of leaves with no nest and are in color much like the leaves and so are not readily seen, and so of the eggs of other birds which are laid in exposed places. A collection of birds' eggs with their great variety of sizes and shapes and the delicate beauty of their colorings is very attractive and interesting. To have value such collections must be made intelligently. The collector should know and record the name of the bird from whose nest an egg is taken; should note where the nest is placed, whether on the ground, or, if in a tree, whether in a hole or on a limb or a swinging branch. Never rob a nest; take not more than one or at most two eggs from one nest. For descriptions of birds' eggs see Davie: *Nests and Eggs of North American Birds;* Bendire: *Life-Histories of North American Birds* (in Smithsonian Contributions to Knowledge) See, also, DEVELOPMENT.

Egg-Apparatus (in plants). A group of three cells, one of which is the egg, which develops in the embryo-sac of *Angiosperms.* See EMBRYO-SAC.


EDWARD EGGLESTON

Eggleston, Edward, an American author, was born at Vevay, Ind., in 1837, and joined the Methodist ministry while quite a young man. He preached for several years in Minnesota, but in 1866 took to journalism. In 1870 he went to New York, and became editor of *The Independent* and later of *Hearth and Home.* His success as a writer of stories led him to give all his time to that work. In 1871 appeared his *Hoosier Schoolmaster*, which at once gave him a wide reputation. *End of the World, Mystery of Metropolisville* and other works soon followed. In 1879 he began a series of biographies of American Indians. He was a thorough student of American history, and wrote an interesting and valuable *History of the United States.* He died on Sept. 2, 1902.

Eginhard (*ā′gĭn-härt*) or, more correctly, **Einhard,** the biographer of Charlemagne, was born in Austrasia (a kingdom of the Merovingian Franks) about 770, and sent to Charlemagne's court, where he soon became a favorite of the emperor. He went with him on all his royal journeys, and was employed in important duties of various kinds. His *Life of Charlemagne* (*Vita Caroli Magni*) is the most important historical work of a biographical sort that has come down to us from the middle ages. It was frequently used as a schoolbook. He is supposed to have died in 840. His *Letters* are also very valuable to the student of history.

Eg′mont, Lamoral, Count of (Prince of Gâvre), was born in Hainault in 1522. After occupying many important positions in the service of the king of Spain, he was appointed governor of Flanders and Artois by Philip of Spain. He now entered into alliance with the party in the Netherlands that was opposed to the Catholic policy of Philip, and from a courtier he became at once the hero of the people. The common opinion is that he was a humane and virtuous patriot who, although he did not care anything about Protestantism as a religion, was anxious to do justice to all the members of that body. When Margaret, duchess of Parma, was made regent of the Netherlands, he and the Prince of Orange entered the council of state and had charge of the few Spanish troops. But when insurrections took place, he broke with the Prince of Orange. He seems to have restored order, and when the Duke of Alva entered the country as lieutenant-general of the Netherlands, Egmont tried to secure his favor, though the Prince of Orange and other chiefs of the insurrection left the country. He seemed to have gained the confidence of Alva, when suddenly he and Count Hoorn were treacherously seized and carried to the citadel of Ghent. He was tried by a court, which, he claimed, had no right to try him, and along with Count Hoorn was condemned, and beheaded in the market place of Brussels, June 5, 1568. A statue now marks the place of their execution. One of the dramas of the great writer, Goethe, has Egmont for its hero. See Motley's *Rise of the Dutch Republic.*

E'gypt, a country in the northeastern part of Africa, between the Great Desert and the Red Sea. It extends from the Mediterranean to the first cataract of the Nile at Assuan. The population is over 15,000,000. Until 1915, when England declared Turkish suzerainty at an end and established a protectorate, Egypt was nominally a Turkish dependency. But since 1883, following Arabi Pasha's rebellion, Egypt had been practically ruled by Great Britain under a consul-general. His duty was to maintain order and administer affairs so that Egypt could pay her debts. England's position was defined, in the polished language of diplomacy, when her minister of foreign affairs wrote Lord Cromer, then consul-general:

> The responsibility, which for the time rests on England, obliges her to insist on the adoption of the policy which she recommends.

The chief cities include Cairo (population, 850,000), Alexandria (population, 455,000), Port Said and Suez.

The area of the subject territory, known as the Anglo-Egyptian Sudan, is about 950,000 square miles, with a population roughly computed at 4,000,000. This area extends southward from the frontier of Egypt to Uganda and the Belgian Congo, a distance of about 1,200 miles, and stretches from the Red Sea to the confines of Wadai in Central Sudan. The chief towns are Khartum (population 27,000), the capital, Omdurman (population 90,000), Halfa, Berber, Suakin, Kassala and El Obeid.

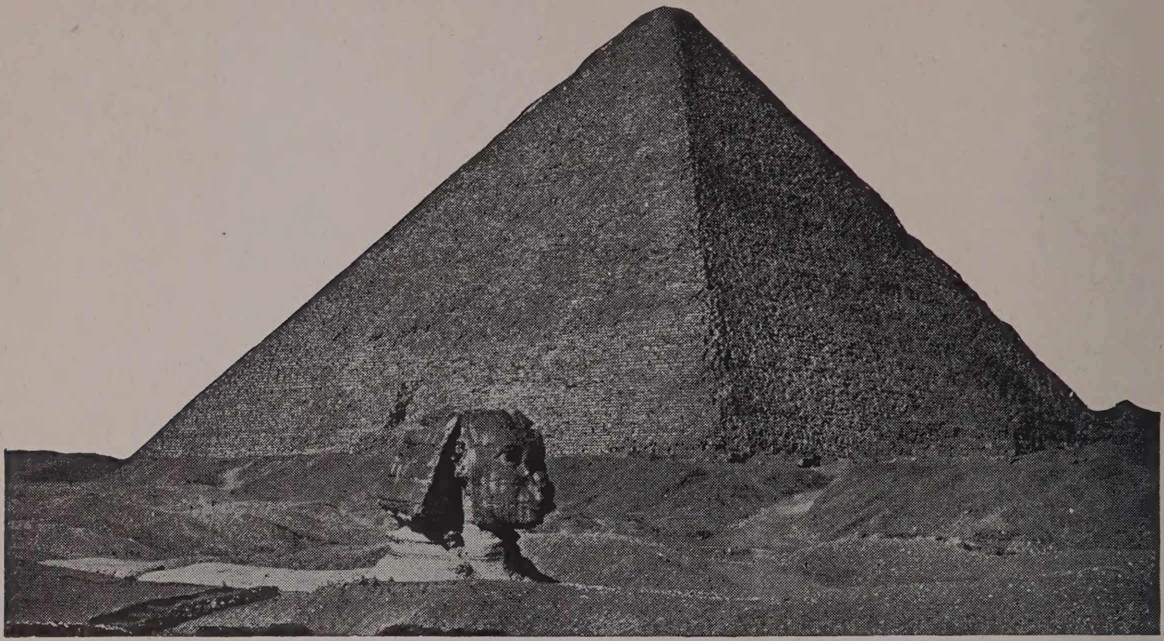
Topography. The main feature of the country is the Nile, with its course of 3,400 miles, which empties into the Mediterranean through two great mouths, its other five having long ago been filled up. The triangular space inclosed between its mouths forms the delta, now called Lower Egypt. The cultivated and settled area of Egypt is that of the Nile valley and delta, comprising 12,976 square miles. A great peculiarity of the Nile valley is the general absence of rain, the land depending on the yearly overflow from the river for the watering. In the middle of July the rise begins to appear, due to rains in the mountainous regions of the south. It reaches its highest point—an average of 35 feet at Thebes and 25 at Cairo—at the end of September, and begins to go down again in the middle of October, falling to its lowest point in April. By the end of November the irrigated land, over which the water has been evenly spread by drains and embankments, has dried and is sown; and in March the crops are ready to be reaped. The course of the river is broken by cliffs and masses of rock which form great cataracts. Over a large extent of the country the rocks are covered with moving desert-sands, and close to the Nile they are covered to a depth of about 30 feet with the soil brought down by its waters.

Agriculture. There is an entire absence of woods and forests in the Nile valley. Even clumps of trees, except the palm, are rare. The fig, pomegranate, orange, lemon, watermelon and grape are common fruits, and the most celebrated flower is the lotus or water-lily The ordinary beasts of burden are the ass and camel. Egypt is an agricultural country, and in some parts three crops in one year are raised Wheat is the chief grain; but barley, corn and clover are largely grown. Sugar-cane, cotton, indigo and tobacco are common products. The country is divided into Upper and Lower Egypt, each of these divisions being subdivided into numerous departments and there now being 15 provinces in all.

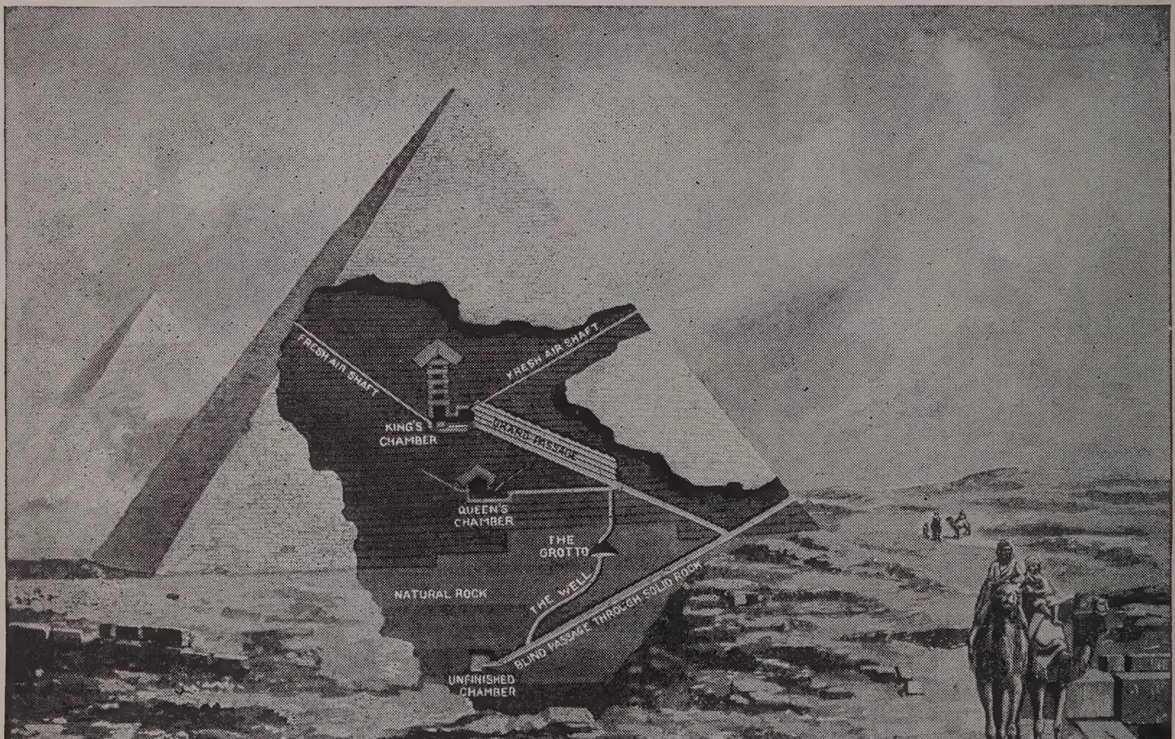
Races and Religions. The people, with the exception of 731,235 Christians, are Mohammedans. They call themselves Arabs, but probably are descended from the ancient Egyptians. The native Christians are called Copts. There also are pure-blooded Arabs, chiefly Bedouins, who live in tents in the desert, with a small number of Turks, Greeks, Armenians, Berbers and Jews. The ancient race probably was of mixed origin, partly Asiatic and partly negro.

The ancient religion of Egypt was a worship of many gods. The principal cities had each a family-group of gods, consisting of a father-god, a wife or sister and a son; these three were usually accompanied by inferior gods. But the worship of some of the groups of three was universal, and not confined to any one city, that of Osiris, Isis and Horus being found all over Egypt. Special animals were also held sacred, the most common

THE PYRAMID TOMBS OF THE PHARAOHS

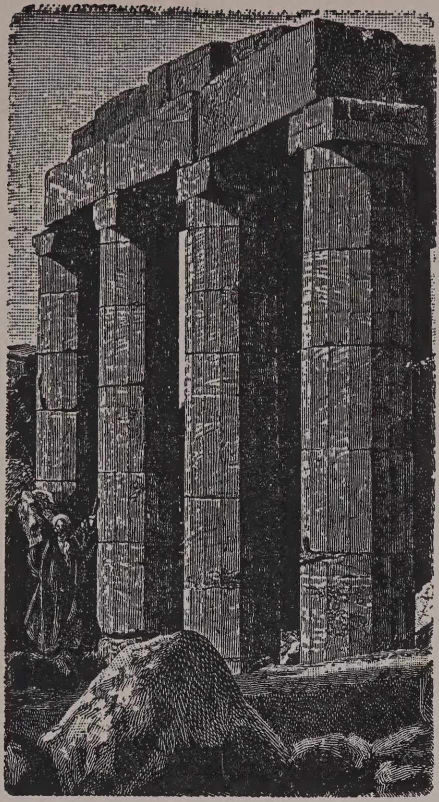


In this picture you see the comparative sizes of the Sphinx and one of the great Pyramids at Gizeh. Both the Sphinx and the Pyramids were the tombs of Egyptian kings or pharaohs, and this picture takes you right into one of the Pyramids.

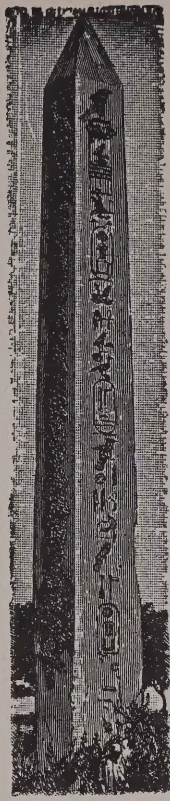


The bodies of the Egyptians were not only preserved in the form of mummies, but the mummies of the kings were hidden away at the end of secret passages, as you see here, so that no one would be likely to disturb them and steal the jewelry and other valuables buried with them. The connection between the blind passage and the one marked "grand passage" was closed with several great stones so arranged that when one was taken out, another would drop into its place and close up this secret passage. After the remains had been laid away and these stones put in place, the attendants went down the passage, marked "The Well," to the blind passage, and so to the outer world again.

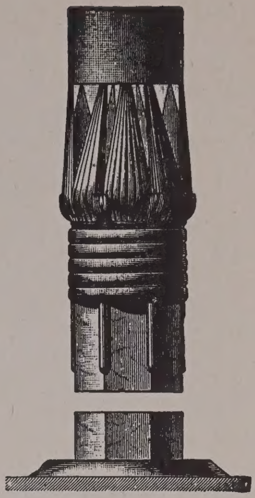
Statue of
Sepa



Temple of Karnak



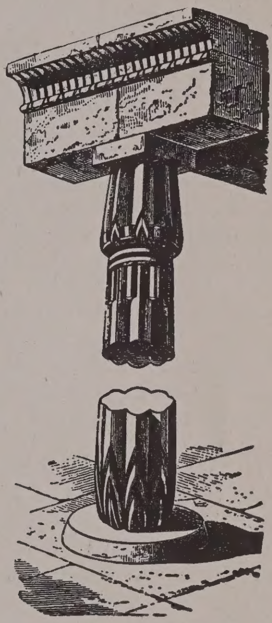
Obelisk



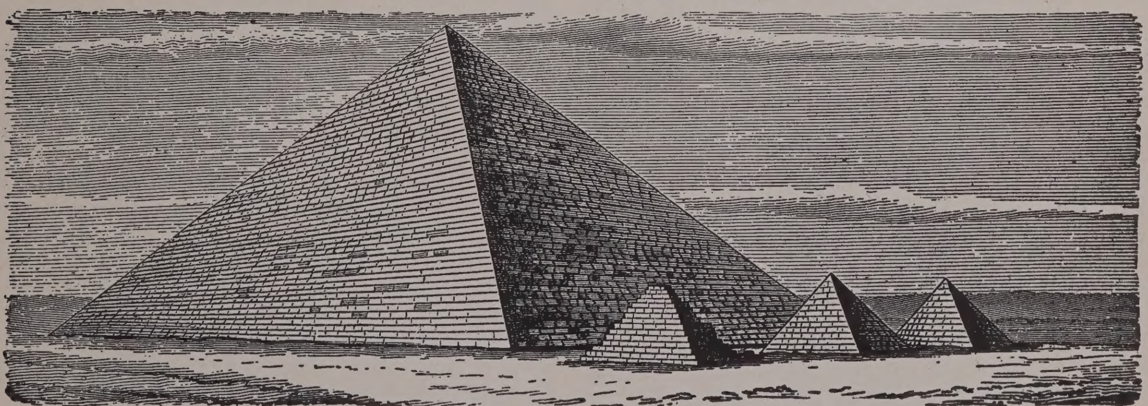
Lotus Column

Statue of
Nesa

Ruins of the Temple of Luxor



Papyrus Column
Karnak



Pyramid of Cheops

being the bull. The Egyptians also believed that the souls of the dead returned to the body after 3,000 or 10,000 years, and so, by embalming the bodies in spices and wrapping them in cloth, they have been preserved for centuries; many of these mummies have been found at different times. The religious buildings of the Egyptians were either temples or tombs. The great pyramids are royal tombs, having small temples in front. The temples were often covered with sculpture and paintings, and frequently were of great size. In front of them were sometimes sphinxes—figures of lions with men's or ram's heads—and also obelisks or great columns of stone.

History. When the Egyptians first became known in history, they already had a wonderful civilization. They had a knowledge of astronomy, geometry, arithmetic, the geography of their own country, etc. They had a system of picture-writing or hieroglyphics, specimens of which are found on their temples and obelisks. Their knowledge of architecture was considerable, and they evidently had a good degree of engineering skill in order to transport the enormous blocks of stone used in building temples and pyramids. They also showed great skill in sculpture, painting and music. In mechanical arts many inventions were early made, as the blowpipe, bellows, saw, chisel, balance, lever, razor, plow and other agricultural tools. A glazed pottery and a kind of glass are also found. In war, chariots came to be used, though the earlier armies were entirely foot-soldiers. War-boats also existed at an early period, and also sea-going vessels. An extensive commerce was carried on with neighboring nations.

In the 3d century B. C., Manetho, a priest, drew up a history of his country, in which he divided the early history down to the conquest of Egypt by Cambyses II (B. C. 524) into 30 dynasties, but the exact length of the dynasties is unknown. Hence the early history is usually dated simply by dynasties. The earliest point in the history we know of is the time of Menes, who is said to have made laws, begun divine worship and founded Memphis. The period of his life is placed by different authorities all the way from 5004 to 3892 B. C. Menes and his successors reigned for something like 250 years, and formed the first dynasty. The second dynasty lasted for about 300 years, but little is known of it. With the third dynasty, lasting about 200 years, the history which is drawn from the old monuments begins. One of the kings of the fourth dynasty, Cheops or Khufer, built the great pyramid at Ghizeh and rebuilt the temple of Isis near the Sphinx. About 2000 B. C. the Hyksos or shepherd-kings arose in Lower Egypt. They probably were a Tartar race, and overthrew the reigning kings, captured Memphis and established themselves in the city of Tanis. Joseph probably was the prime-minister of one of these kings, Apepi, at Tanis; and storehouses, such as he built are still to be seen at Pithom. The rulers of Upper Egypt afterward drove out the shepherd-kings. Egypt was raised to its highest point of glory by Thothmes III (B. C. 1445); all Syria and part of Mesopotamia were subject to him, and he received tribute from Assyria, Babylon, Phœnicia, Central Asia and the Ethiopian tribes of the south. A later king, Rameses II, carried on a long war with the Hittites, with whom he finally made a treaty. He was a great king, and Egypt was still in the height of her glory during his reign, which was about 1322 B. C. His son probably was the Pharaoh spoken of in the Bible, when the Israelites under Moses left Egypt. His son closed the 19th dynasty. With the 26th dynasty the history of Egypt became involved with that of Greece and Judæa. One of her kings helped Hezekiah against Sennacherib, king of the Assyrians. Necho II planned the canal across the Isthmus of Suez, but gave it up, cutting one from the Nile to the Red Sea that remained in use for centuries. He defeated Josiah, king of Judah, and conquered Palestine, but was himself defeated by Nebuchadrezzar. A later king, Amasis, was a friend of the Greek colonists in Egypt, but was conquered by Cambyses, king of the Persians, and Egypt was under Persian rule for many years. While a Persian province, Egypt was conquered by Alexander the Great, who founded Alexandria in 332 B. C. Under the succeeding Ptolemies the royal court became a center of learning and philosophy, and the great library at Alexandria was established. After the rule of the celebrated Queen Cleopatra, which ended with the battle of Actium (31 B. C.), Egypt became a Roman province. In 639 A. D. the Arabs invaded the country, and Egypt became a Mohammedan province. One of her governors made himself practically independent, and annexed Syria. Later the line of the Fatimi caliphs conquered Egypt and founded Cairo. They were deposed by the Kurd general, Saladin, who carried on the war against the European crusaders. One of Saladin's descendants introduced the bodyguard of *Mamelukes* or white slaves, who on his death usurped the supreme power (1250), and kept it for two centuries. These slave-kings were distinguished for valor, ability as rulers, luxury and encouragement of art. In 1517 their brilliant rule came to an end on the conquest of Egypt by Selim I, the Ottoman sultan.

Nearly three centuries of weak and corrupt government by Turkish governors or pashas, varied by rebellions of the Mameluke chiefs, bring us to the French invasion of Bonaparte in 1798. He conquered the country, but the French were soon driven out by the British, and Egypt was given back to the Turks in 1801. In 1805 Mohammed Ali became pasha. He completely overthrew the Mameluke chiefs, formed a regular army and introduced the beginnings of European civilization. He annexed Nubia and part of the Sudan, and his son conquered Syria. He was succeeded by his grandson, who was superseded by Mohammed Ali's youngest son, Said Pasha. Under Said the Suez Canal was cut by the French engineer, M. de Lesseps, and was opened in 1869. Said was succeeded by his nephew, Ismail, who, a few years later, took the hereditary title of khedive, and soon after bought from Turkey the right to make treaties and maintain an army, thus making himself practically an independent ruler. He began many improvements, such as the building of roads and bridges, the constructing of railroads and telegraphs; he reformed the postal service, improved the harbors, supported education and introduced better courts of law. Through Sir Samuel Baker and Charles Gordon, ("Chinese Gordon"), his governors of the great region known as the Sudan, he suppressed the slave-trade. In order to carry out all his reforms, however, he fell very heavily into debt. Various financiers were sent from England to try to arrange a system of managing the money-matters of the government, and finally England and France were given a controlling influence in the government The khedive's unwillingness to pay the debts due European bankers led the European governments to demand his abdication, and he was deposed by the sultan of Turkey in 1879, being succeeded by his eldest son, Tewfik. A law for the management of the public debt was passed in 1880. Next year Arabi Pasha became minister of war, and finally openly opposed the khedive and European interference, being strongly supported by the natives, who disliked the Europeans. British and French warships were sent to Alexandria in 1882, but the French ships sailed away and the attack was made by the British alone. Arabi withdrew from the city, but large numbers of European citizens were killed by the natives before a force could land to enforce order in the city. Meanwhile Sir Garnet (later Lord) Wolseley was sent out with more troops from England and completely defeated Arabi's army at Tel-el-Kebir. Arabi was banished to Ceylon. Since then England has had a controlling influence in the government. In 1882 began the great rebellion in the Sudan. That region had been governed as a province of Egypt; but Mohammed Ahmed, calling himself the Mahdi (a kind of Mohammedan Messiah), put himself forward to free the Mohammedan faith from its enemies. He captured El Obeid, and completely destroyed an army sent against him under the command of an English officer, Hicks Pasha (1883). His influence spread rapidly, and he gained other important victories. Meanwhile General Gordon was sent out from England to secure the withdrawal of the Egyptian garrisons from the Sudan, Egypt having agreed, by England's advice, to give up most of her possessions in the Sudan. Gordon kept his position at Khartum against the Mahdi, but found he could not get the garrisons away without reënforcements. Unfortunately, England delayed too long in sending the reënforcing expedition, which approached Khartum only to find that it had been taken and Gordon killed two days before (Jan. 26, 1885). The expedition withdrew, and left the Sudan to its native tribes and the Mahdi. Since then the Mahdi has died; but the affairs of the Sudan have, under British energies, taken on an entirely new and greatly improved aspect. This is in large measure due to the valor of General Sir H. H. (later Lord) Kitchener, who in 1892 was made Egyptian Sirdar, and in 1896 was commander-in-chief of an expeditionary force, composed chiefly of Egyptian and Sudanese troops under British officers, who undertook at the order of the English government to reconquer the Sudan. Since the fall of Khartum the English had held the rebellious dervishes at bay at Wady Halfa, as far as the Egyptian frontier then extended. In May, 1896, a brigade of Indian troops was brought from Bombay to Suakim and joined the Sirdar's expedition, which now advanced. By September, Dongola, after sharp fighting, was occupied. The next year, Abu-Hamed and Berber fell before the Anglo-Egyptian onslaught; while in 1898 a dervish-army of 16,000 men, after severe fighting, was worsted on the Atbara, and the khalifa's entire force of 50,000 men was later in the year totally defeated at Omdurman and the city occupied by Kitchener and his gallant force. The dervish slaughter was terrible but the Sudan was thus re-conquered.

Recent History. After the conclusion of the World War in 1918, Egypt petitioned for complete independence from Great Britain. By 1923 the latter country had granted practical freedom, and the following year Egypt sent ministers to the nations of the world, thus directing her own affairs. Great Britain maintains a high commissioner in Egypt to watch political movements, and guard British investments in Egypt and, along the Suez Canal.

Sudan. Egypt in 1925 requested that Great Britain yield this land entirely to her. Great Britain refused, since British interests have invested millions of dollars in gigantic irrigation projects which will some time be of great value.

Communications. In the Delta Region trade and travel are chiefly by rail; in the Upper Nile region, by rail and water. The first railroad, that from Cairo to Alexandria, was begun in 1852. Both cities are now connected with Suez and all important towns in the Delta by branch lines. As in the case of waterways in other countries, the Nile is largely used for the transportation of goods where speed in delivery is not an important consideration. Above Assuan it is the only means of communication, and a trip on the Upper Nile is one of the picturesque features of "doing Egypt." Caravan routes connect the Nile with the oases to the west and with the Red Sea.

See PYRAMIDS, CAIRO, ALEXANDRIA, SUDAN, GORDON. See Sir Gardner Wilkinson's *Manners and Customs of the Ancient Egyptians;* A. B. Edwards: *A Thousand Miles up the Nile;* S. Lane-Poole: *Egypt;* and Baedeker's *Egypt.*

Ehrenbreitstein (*ā-ren-brīt'stīn*), a town and fortress of Rhenish Prussia. It is situated on the right bank of the Rhine, opposite Coblenz, with which it is connected by a bridge of boats and an iron railroad-viaduct. The fortress is on a high, rocky summit, 387 feet above the river, and is very strong. It was begun in 1672, and was captured by the French in 1799, who blew up the works two years later. It was turned over to Prussia by the Congress of Vienna in 1815, and was soon again fortified. Population of the town 5,299.

Eiffel (*ī'fĕl*), **Gustave,** a French engineer, was born in 1832. He engaged in many important works of engineering, as the construction of the bridge over the Douro at Oporto, the design of the great locks intended for the French Panama Canal and the building of the iron framework of Bartholdi's statue of Liberty. But the work with which his name is most prominently associated is the famous Eiffel Tower on the *Champ-de-Mars*, in Paris, which was completed on March 31, 1889. It comprises three stories, reached by a series of elevators, the platform at the top being 985 feet above the ground. A little less than 7,000 tons of iron were used in building it. The cost was about $1,000,000, of which $300,000 were voted by the government, the rest being supplied by M. Eiffel, who expects to recoup himself by the admission-fees during the 20 years for which they are granted to him. Died 1924.

Einstein, Albert, German-Swiss physicist, celebrated for his discovery and statement of the theory of relativity (*q. v.*). He was born at Ulm, Germany, in 1879, attended school in Switzerland, became a Swiss citizen, and for some years was examiner of patents at Berne. In 1909 he began to lecture at the University of Zurich, and after 1914 at Berlin. He made many important discoveries in molecular physics.

Eisenach (*ī'zen-äk*), a town of Germany, in Saxe-Weimar, on the northwestern edge of the Thuringian forest. The castle of Wartburg stands 600 feet above the town. It was built in 1067, and was the home of St. Elizabeth and also the ten months' asylum to which Luther was borne by the elector of Saxony in 1521. It also was the birthplace of Bach, the great composer. The chapel in which Luther preached, with the room he occupied and in which he overcame the Evil One by throwing an inkstand at his head, is still pointed out The town has a population of 35,153.

Eland. See ANTELOPE.

E'lastic'ity, a general property of matter, which may be briefly but roughly defined as the resistance which a body offers to a change either of size or of shape. A more accurate definition is the already classical one of Lord Kelvin, which runs as follows: "Elasticity of matter is that property in virtue of which a body requires force to change its bulk or shape, and requires a continued application of the force to maintain the change, and springs back when the force is removed, and, if left at rest without the force, does not remain at rest except in its previous bulk and shape."

When two or more forces are applied to a body in such a way that their resultant is zero, there is no acceleration, and no evidence, therefore, from the motion of the body, that such individual forces are acting. Such forces are said to be in equilibrium. A pair of forces in equilibrium is called a stress. The change in shape or size which results from such a stress is called a strain. And the elasticity of any body is measured by the ratio of the stress to the corresponding strain. Thus:

$$\text{Elasticity}=\frac{\text{Stress}}{\text{Strain}}$$

In nature we meet practically three kinds of stresses. To each of these three stresses corresponds one kind of elasticity, each of which is included, however, in the general definition given above. We proceed to consider these three types of stresses.

I. ELASTICITY OF LENGTH

When a force is applied to a body in such a way as to alter its length, either by compressing it or stretching it, the force is necessarily distributed over the cross-section of the body. The longitudinal stress at any point in a body is defined as the ratio of the force to the area at that point. A longitudinal stress always produces an elongation of the body to which it is applied. The total change in length depends not only upon the stress but upon the original length of the body. Accordingly the longitudinal strain is defined as the ratio of the total elongation to the length. Now the elasticity of length for any material is measured by the ratio of the longitudinal stress to the longitudinal strain. And hence for this ratio, which is generally known as Young's modulus, we have

$$\text{Young's Modulus} = \frac{\text{Longitudinal stress}}{\text{Longitudinal strain}}$$

If a force F, applied to a wire of cross-section *a* and length L, produces an elongation *e*, then

$$\text{Young's Modulus} = \frac{\left(\frac{F}{a}\right)}{\left(\frac{e}{L}\right)} = \frac{F\,L}{e\,a}$$

This is the equation employed by engineers in computing the proper cross-section of the ties in a bridge.

II. ELASTICITY OF VOLUME

Let us denote the volume of a body by V. Imagine the volume to be subjected to pressure, so that it is diminished by an amount *v*. The ratio of the diminution to the total volume is called the voluminal strain. Suppose further that this change of volume has been produced by applying a force F to a surface of area *a;* as, for instance, when air is compressed in an ordinary bicycle-pump. The ratio of the total force to the area over which it is applied is the voluminal stress; and is what we call pressure. In accordance with our general equation, the elasticity of volume for any material is measured by the ratio of the voluminal stress to the voluminal strain. This ratio is generally known as the bulk modulus, and is commonly denoted by *k*.

$$\text{Bulk Modulus} = k = \frac{\text{Voluminal stress}}{\text{Voluminal strain}}$$

$$k = \frac{\left(\frac{v}{a}\right)}{\left(\frac{v}{V}\right)} = \frac{F\,V}{a\,v}$$

The reciprocal of the bulk modulus is what is known as the compressibility of a substance.

III. ELASTICITY OF SHAPE

When a rod or shaft is twisted, the two surfaces which face one another at any cross-section of it are displaced one over another in exactly the same way (though not to the same extent) in which they would be if cut in two by a pair of shears. Such a strain is called a shearing strain, and the stress (force per unit area) is called a shearing stress. The ratio of the shearing stress to the shearing strain is called the rigidity modulus.

$$\text{Rigidity modulus} = \frac{\text{Shearing stress}}{\text{Shearing strain}}$$

The rigidity modulus of any material measures its ability to resist a shear, and hence its fitness for mill-shafting, for propeller-shafts of steamships, etc. A quantitative discussion of rigidity would be too long for our limited space, but may be found in any good treatise on strength of material. Elasticity of shape is employed as a criterion by which to divide all bodies into two fundamental groups: solids and fluids. Solids are defined as those bodies which exhibit both elasticity of shape and elasticity of size. Fluids are bodies which possess elasticity of size but do not possess elasticity of shape. Bodies which exhibit no elasticity are called rigid. They do not exist in nature; but there are many bodies which we may, without error, treat as rigid. See Watson's *Physics* or Minchin's *Statics* for an excellent account of this subject. HENRY CREW.

El'aters (in plants). Peculiar cells which develop among the spores in the spore-cases of many liverworts, as *Marchantia.* They are long, slender and spirally thickened, and by their jerking movements help to scatter the spores. See HEPATICÆ.

Elba. See NAPOLEON.

Elbe, a large river of northern Europe, takes its rise from the flowing together of many small streams which have their origin on the southern side of the Giants' Mountains on the northern border of Bohemia. Its total length is about 725 miles, and it is navigable for 525 miles, but for sea-vessels only up to Hamburg (84 miles). Of its many tributaries the most important are the Moldau, Eger, Mulde, Saale and Havel, and in connection with these is a fine system of canals. The general direction of the river is northwestward, and it empties into the North Sea at Cuxhaven, where its mouth is ten miles wide. Within the mouth, which really is an arm of the sea, the tide rises about ten feet. The numerous islands between Hamburg and Harburg divide the river into several branches, and between Hamburg and the sea the sandbanks and shoals leave only a very narrow channel. The navigation was formerly hindered by all sorts of tolls, but these were all abolished in 1870.

Elberfeld (*ĕl'bĕr-fĕlt'*), one of the manufacturing capitals of Germany, is situated 16 miles from Düsseldorf, on a small stream flowing into the Rhine. The town is famous for its dyeing, bleaching and calico-printing establishments; also for large manufactures of cotton, silks, tapes, ribbons, thread, lace, buttons, fancy woolen goods, etc. Its Turkey-red dyeworks are especially noted. There also are manufactures of machinery, iron and steel wares, pianofortes, paper and carpets, besides large breweries. For miles around an immense number of weavers labor for the Elberfeld factories. Population, 170,118.

El'der. A species of *Sambucus*, a genus belonging to the honeysuckle family. They are shrubby plants with pinnately compound leaves and numerous small white flowers in flat clusters, followed by the characteristic black, purple, red or (rarely) white berries. The stem contains a conspicuous pith. The genus contains about 20 species widely distributed, about five occurring in the United States. The two eastern forms are *S. canadensis*, the American elder, with purple or black berries; the other is *S. pubens*, the red-berried elder.

El′don, John Scott, an English lord-chancellor, better known as Lord Eldon, was born in 1751. After studying at Oxford University for some years, he took to the law and soon gained great success as a lawyer. He entered the house of commons in 1783, was knighted and appointed solicitor-general in 1788, and made attorney-general in 1793. In 1799 he was appointed chief-justice of the court of common pleas, and in 1801, as Baron Eldon, he became lord-chancellor. a position he held, with only a short intermission, for twenty-six years. He died in 1838.

El Dorado (*ĕl′dô-rä′dô*), meaning the golden or gilded land, was a country supposed by the Spanish discoverers of America to exist somewhere in the New World. Their imaginations were fed by stories of the natives, and after the voyage of Orellaña down the Amazon in 1540 the report was greatly enlarged, and the locality of the fabulous region was placed near the headwaters of the Orinoco. Many a soldier of fortune perished in the search for it, and many a troop of adventurers came back with only a small part of their original number, before the city of gold was reluctantly looked upon as a fable of greedy minds, which liked to dream of greater rewards than the riches of Mexico and Peru. The most famous expeditions were those of Philip von Hutten and of Sir Walter Raleigh; a subsequent quest was that of Antonio Santos as late as 1780. See Von Langegg's *El Dorado.*

Elections. An election is the act of selecting a person or persons for some office. Elections often take place at stated intervals in connection with clubs, societies and similar organizations, with a view to having the different offices of the organization filled by the best available persons.

An election in politics is the act or process of publicly choosing by vote a person or persons for public office. In general, the most important political elections are those for the legislative bodies of the various countries and, in republics, the election of the president. It has been found necessary to pass many laws for the regulation of important elections, with a view to the prevention of bribery and corruption. In the United States, Federal laws regulate the election of Federal government-officials, such as the president, vice-president and members of Congress, while state-laws regulate the election of state officials. Voting is now usually by ballot.

A ballot formerly signified a little ball used in secret voting, But voting by ballot has now come to mean simply secret voting, irrespective of the particular means used. The commonest form of ballot now in use is that of a ticket, with the names of the candidates for the office printed upon it. The voter casts his vote by putting some mark, such as a cross, opposite the name of the person or persons for whom he wishes to vote. Sometimes the names of all of the candidates are arranged in separate columns on the ballot, all the Republican candidates in one column, all the Democrats in another, etc. One object of this is to encourage the voter to vote a straight ticket, that is, to vote for all the candidates of the one party to the exclusion of all the candidates of the other party. The expense of preparing and distributing the ballots is now usually borne by the state.

A majority is simply the excess of votes that one party receives over another party or parties at an election. For instance, if A receives 100 votes, B 80 and C 60, A has not a majority, as he received or y 100 votes out of 240, or less than half of the total number of votes cast. If A had received 200, B 80 and C 60, A would have a majority of 60.

A plurality, on the other hand, is the number by which the votes for the highest of a number of candidates exceed those of the next highest candidate, when the candidate receiving the greatest number of votes has not a majority of all the votes cast. Thus, if A receives 100 votes, B 80 and C 60, A has a plurality of 20, having 20 more than the next highest candidate B. Sometimes the word majority is loosely used in the sense of plurality.

A primary election is the means used to nominate the candidates for office in a general election. Only members of the particular party concerned take part in in it; that is, there are Republican primaries for nominating the candidates of the Republicans and Democratic primaries for nominating the Democratic candidates. In many places the primary elections have at times degenerated into selfish partisan organizations from which the majority of the voters of the party were excluded. Abuses of this nature have led to the passing of laws in many states for rigidly regulating the primary elections. These laws in the main provide that sufficient public notice of the meeting shall be given, that the voting shall be by ballot, that the election-officials shall be sworn, that frauds shall be duly punished and that the expense involved, except in a few cases, shall be borne by the state.

Electoral College. The persons who, according to the political system of the United States, are chosen by the people or the party state committees of the different states to elect the president and vice-president, are called electors. The electors of all the states form the electoral college. After the votes of the presidential election are canvassed and announced, the electors of each state meet and vote by ballot for the president and vice-president. To obtain the electoral vote of a state, any party must carry the state in a presidential election. Unless a party carries a state there is no electoral vote to count. By act of Congress, electors meet on the second Monday in January following the presidential election, to cast their ballots. The place of meeting is fixed by the state, which is sole judge over disputes.

The number of votes in the electoral college is the sum of the number of United States senators, ninety-six, and the number of representatives, 435, making a total of 531. In reality, there are forty-eight electoral colleges, as each state has as many electors as it has senators and representatives, and these electors meet by states. Originally, they were intended to use their own judgment in casting votes, but now they simply vote for the candidates nominated by their party. A majority of the electoral votes, 266, is required for an election. If no candidate has a majority, the House of Representatives chooses the president, and the Senate chooses the vice-president. Thomas Jefferson in 1801, and John Quincy Adams in 1825, are the only presidents so elected, and Richard M. Johnson in 1837 the only vice-president.

A reapportionment in 1930 shifted twenty-seven votes in several states, which affected the 1932 election. The "lame duck" amendment of 1933, by which the president and vice-president take office on January 20, and Congress meets annually on January 3, has necessitated action setting forward the date on which Congress counts the votes for president and vice-president, formerly done on the third Wednesday in February.

Electricity. The rubber handle of a fountain-pen when rubbed over the sleeve of one's woolen coat, acquires the property of attracting small bits of paper or wood; glass rubbed on silk behaves in the same way. The substance earliest discovered to have this property is amber, a fossil resin found on the shores of the Baltic Sea. The Greeks called this resin electron, and hence later (1603 A. D.) Dr. Gilbert called this phenomenon electric, and gave us our word *electricity*. These facts have been known ever since the time of Thales (600 B. C.); and for two thousand years following him they constituted the whole of electric science, barring some knowledge of lightning and the electric eel.

Bodies which have acquired the property of attracting small bits of paper are said to be electrified or to have an electric charge.

I. ELECTROSTATICS

The fundamental facts upon which the science of electrostatics (*i. e.*, the science which deals with electric charges) is built, are as follows:

1. From a large number of experiments it has been found that not only rubber or amber but *any* substance, on being rubbed with any other substance, becomes electrified. Even the tip of a camel's-hair brush, when touched to a table-top, shows electrification. Of course this requires some delicate means of detecting the electrification, such as a pair of gold leaves suspended on a glass support. Such an instrument is called an electroscope. Since electrification is produced by such slight means, we are led to think that "any two substances brought into contact become electrified." This statement may be called the *first law of electrostatics.*

2. A second fundamental discovery in electrostatics was made by Stephen Gray, who died in 1736, in London. He found that when some bodies, such as metals, are electrified, the charge immediately leaks off unless the metal be supported upon glass, rubber, or resin. Those substances which lead off the charge quickly, he called conductors; those which prevent the charge from escaping, he called non-conductors or insulators. There are some substances, as gas, carbon, ordinary water, cotton-thread, which occupy an intermediate position between conductors and non-conductors.

3. A third great discovery in electrostatics was made by Dufay, who found that all electrified bodies may be divided into two classes according as they attract or repel a given electrified particle—such as a pith-ball suspended by a silk thread and charged. The electrification which appears on glass when rubbed with silk Dufay called vitreous; we now call it positive. That kind of electrification which appears on sealing-wax or gutta-percha when rubbed with flannel, he called resinous; we now call it negative. Bodies charged with the same kind of electrification repel each other; bodies charged with opposite kinds of electrification attract each other.

4. Just how much two charged bodies attract or repel each other was first measured by the French physicist Coulomb, who lived from 1736 to 1806. His answer constitutes what we may call the fourth great discovery in electricity. By means of a torsion-balance he found that two particles at distance r from each other, and carrying charges e and e 1 respectively, attract or repel one another, *in air*, with a force F, which is given by the following equation:

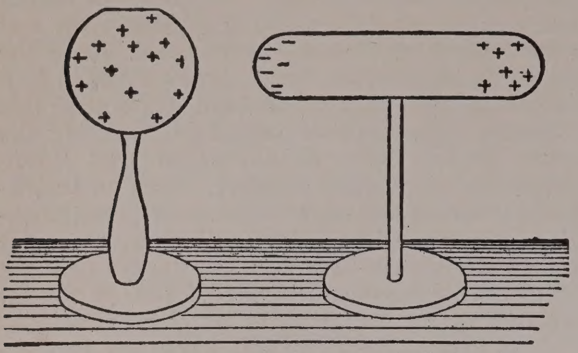
$$F=\frac{ee\acute{e}}{r^2}$$

Cavendish and Faraday found later that this expression had to be modified, when the medium between the two particles was other than air, so as to read:

$$F=\frac{ee\acute{e}}{Kr^2}$$

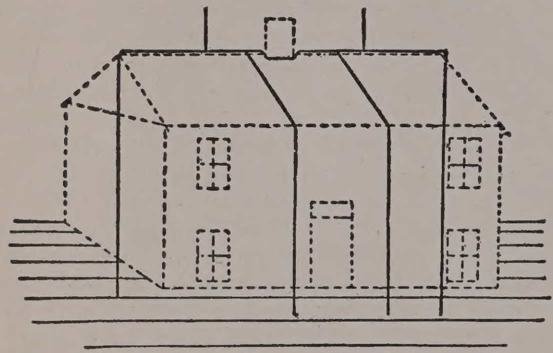
where K is a constant which is known as the specific inductivity of the medium; for ordinary glass its numerical value is about six, for paraffine about two.

5. Stephen Gray found that he could charge a conductor by simply bringing it into the field of another charged body. If now the conductor be connected to earth and immediately afterward disconnected, it will be charged with electrification opposite in sign to that of the original charge. This is known as the phenomenon of electrostatic induction, and will be clear from Fig. 2.



The phenomenon of electrostatic induction

6. A sixth important fact was thoroughly established by Faraday: When electrification is produced by friction, by induction or by any other means, the positive and negative charges so produced are always equal.



Maxwell's method of protection against lightning

7. Faraday also established the fact that the charge on the outside of any closed conductor is distributed in such a way that it produces no electric field—no electric force—inside the closed conductor. It was with this principle in mind that Maxwell suggested, as the best method for protecting houses from lightning, to place them in a network of conductors (see fig. 3) which shall as nearly as possible be equivalent to a closed conductor. For more extended description of the phenomena of electrostatics see S. P. Thompson's *Elementary Lessons in Electricity and Magnetism*. For a simple and interesting mathematical discussion of the subject see J. J. Thomson's *Elements of Electricity and Magnetism*.

II. ELECTRIC CURRENTS

If two charged conductors are connected by means of a wire, it is observed that in general the wire and the region about it acquire new and remarkable properties. The wire itself becomes warmer, and the region about it becomes a magnetic field. A wire which possesses these properties is said to have an electric current flowing through it. For methods of detecting the presence of an electric current in any circuit see GALVANOMETER.

There are many methods of producing electric currents but the most important ones from a practical point of view are the three following: the method of Galvani and Volta—the so-called voltaic cell; the method of Faraday—cutting lines of magnetic force—exemplified in the ordinary dynamo; and the thermo-electric method discovered by Seebeck.

THE VOLTAIC CELL

Volta discovered in 1800 that, by joining in series two conductors of the first class (see ELECTROLYSIS) and one conductor of the second class, he could obtain a continuous electric current at the expense of the chemical energy stored up in the liquid and the metals. Two conductors of the second class, together with one of the first class, will also produce a continuous current. Such a combination as either of the preceding is called a voltaic cell. A typical cell of this kind is one in which a strip of zinc is immersed in a solution of zinc-sulphate and a copper strip in a solution of copper-sulphate, the two solutions being separated by a porous partition. It is then found that, on joining the copper and zinc terminals with a wire, the positive electricity flows along the wire from the copper to the zinc. Accordingly, the copper is called the positive pole and the zinc the negative pole of the battery. Since, however, inside the cell the current flows from the zinc to the copper, the zinc-plate is called the positivee lectrode and the copper-plate the negative electrode. (See ELECTROLYSIS.)

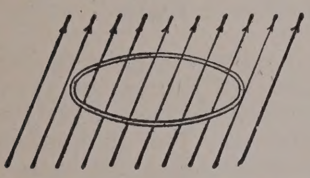
There is a great variety of cells; some adapted to one purpose, some to others. The one just described is known as the daniell cell. In the storage-cell the electrodes are of lead and lead-peroxide respectively, and the electrolyte is dilute sulphuric acid. The lead-plate is the negative one; the lead-peroxide is the positive one. When the circuit is closed, the lead-peroxide plate gives up a part of its oxygen, while the lead-plate, the negative electrode, becomes oxidized, until finally the two electrodes become very much alike and the current, therefore, becomes less and less, other things being the same. The battery is now said to be discharged. For two electrodes which are alike never give a current when immersed in any one electrolyte. But in order to put the cell again in good working shape, it is necessary only to pass an electric current through the cell in a direction opposite to that obtained when the cell was in use. This process is known as *charging* the cell. The charging simply restores the oxygen to the positive plate, and removes the oxygen from the negative plate, leaving it spongy, metallic lead.

The following two features distinguish this from most other voltaic cells: The plates are prepared, *i.e.*, made chemically different, by electrical means. They are capable of yielding currents which are enormous when compared with those from other forms of batteries.

INDUCTION OF ELECTRIC CURRENTS

Faraday in 1831 succeeded, by a beautifully simple method, in producing electric currents without the use of the voltaic cell and without the use of heat.

If we consider any closed circuit (say a piece of copper wire bent into the form of a circle or square) placed in a magnetic field, we may think of it as containing or inclosing a number of lines of force, as a fence might inclose a group of trees. In Fig. 4 six lines of force are represented as inclosed by the wire-circle. If by any means the magnetic field were made twice as strong, we should represent this change by drawing the lines of force twice as close together, so that now the circle would inclose twelve instead of six lines. Or, if the copper-circle were carried parallel to itself to another region where the magnetic field were not so strong, then we should describe this change by drawing fewer lines of force through the circle. Faraday's discovery was simply this: "When, by any means whatever, the total number of lines of force passing through any circuit is changed, an electric current is produced in that circuit." Such a current is called an induced current.


Magnetic Line of Force inclosed by an Electric Current

This discovery of Faraday's is frequently, and perhaps fairly, considered the most important one ever made in electrical science; since upon this principle are constructed the dynamo, the telephone, the transformer, etc. See articles on these three subjects.

THERMO-ELECTRIC CURRENTS

Seebeck in 1821 discovered that, when a closed circuit is made up of two different metals and the two junctions of the metals are kept at different temperatures, an electric current flows around the circuit. The source of energy which supplies this current is the heat absorbed at the hot junction. The presence of such an electric current as this in a circuit is one of the most delicate tests known for a difference of temperature between the two junctions.

EFFECTS OF ELECTRIC CURRENTS

1. *Chemical Effects.* (See ELECTROLYSIS.) One of the chemical effects of an electric current has been employed to define the size of the unit of current, for the international congress of electricians at Chicago in 1893 agreed to define the unit-current as one which deposits silver at the rate of 0.001118 grams per second. This unit is called an ampère. See AMPÈRE.

2. *Heating Effects.* Everyone who has seen an incandescent lamp knows that an electric current in passing through a carbon filament may raise its temperature to such a point that the carbon becomes white-hot. Joule, the English physicist, showed that the amount of heat developed between any two points in a conductor varies directly as the square of the current, directly as the time and directly as a constant depending upon the shape, size and chemical composition of the wire. Let us denote the heat developed by H, the current by C, the time by t and the constant for any conductor by R. Then by properly choosing this constant we may write:

$$H = C^2Rt.$$

The constant R thus defined is known as the electrical resistance of the wire. The resistance of a wire may then be considered as a quantity which determines how much heat will be developed in it in a given time by a given current. The size of the unit of resistance is that offered by a column of mercury of uniform cross-section, at 0°C, when its length is 106.3 centimeters and its mass is 14.4521 grams. This unit is called an ohm.

3. *Magnetic Effects.* About every wire conveying a current is a magnetic field. This field may be represented by drawing closed lines of force including the current. It is these lines of force which magnetize a piece of iron placed in a coil of wire carrying a current. The behavior of the electromagnet and the telegraph-sounder depends upon this principle. An exceedingly important inference from this magnetic effect is the fact that an electric current, in any movable circuit, always sets itself so as to include as many lines of force as possible. This is the principle of the instrument which Lord Kelvin devised in 1867 for receiving messages over the Atlantic cable. It is, indeed, the principle of all galvanometers with movable coils and of all electric motors.

OHM'S LAW

A dynamo or a voltaic cell may be considered as an instrument for driving an electric current through a circuit or, in short, as an instrument for producing electrical pressure. Ohm, a German mathematician, showed in 1827 that

1. When, in any circuit, the electrical pressure remains constant, the current varies inversely as the resistance. 2. When, in any circuit, the current is to remain constant, the electrical pressure must be varied directly as the resistance varies. 3. In any circuit in which the resistance is kept constant, the current varies directly as the electrical pressure.

These facts together constitute Ohm's law, and may be expressed algebraically as follows: When C denotes current, R resistance and E electrical pressure, then

$$C=\frac{E}{R}$$

The quantity which we have called electrical pressure is generally called electromotive force. The unit of electromotive force is that which will send a current of one ampère through a resistance of one ohm. This unit of electromotive force is called a volt. Electromotive force is very frequently denoted by E. M. F. The E. M. F. of a daniell cell is very nearly one volt; that of a lead storage-cell is approximately 2.1 volts.

ELECTRICAL UNITS

These three units, the ampère, ohm and volt, whose standard values we have given above, are all logically connected with the three fundamental units, the centimeter, the gram and the second; but the reasoning which leads to the arbitrary definitions given above is too long for this brief sketch. For a full account of this matter see Thomson's *Elements of Electricity and Magnetism* or Thompson's *Elementary Lessons in Electricity and Magnetism.*

Henry Crew.

Electric Lamps are of two kinds: arc and incandescent. Both depend upon the general principle that the heat developed in any part of a circuit by a constant electric current varies directly as the resistance of that part of the circuit; or, what is the same thing, the heat developed in an electric circuit by a constant electromotive force varies inversely as the resistance. (See Electricity.)

THE ARC-LAMP

The arc-light was first employed by Sir Humphry Davy, but it became a commercial success only after the modern dynamo had been perfected, say about 1876. An arc-lamp consists generally of two carbon-poles connected with some source of current, exerting an electrical pressure of from 30 to 90 volts between the terminals of the carbon. The arc is started by bringing the carbon-poles into contact, and then slowly separating them by a distance of a millimeter or more. The resistance of the vapor thus formed between the poles is so large, that an enormous amount of heat is developed and the ends of the carbon-poles become white-hot. The positive pole becomes much hotter than the negative pole, so that for purposes of illumination the positive pole is generally placed above the negative one; and when the arc is used in a projecting-lantern the positive pole is always made to point forward, *i.e.*, toward the screen. The temperature of the arc is unknown, but an average of the best measurements indicates that it is about 3,600° C. Owing to the fact that the oxygen of the air is electronegative, the positive pole is consumed about twice as fast as the negative. Hence the arcs used for street-lighting (and therefore automatically fed) are so arranged that the positive carbon is fed in twice as rapidly as the negative. These street-lights are always arranged in series, from twenty to fifty being placed on each circuit, according to voltage. The arc-lamp has been greatly improved for many purposes by inclosing it in a small glass-hood, which prevents easy access of air and thus greatly lengthens the life of the carbon. This hood at the same time acts as a diffusing screen, and decreases the fierceness of the light.

THE INCANDESCENT LAMP

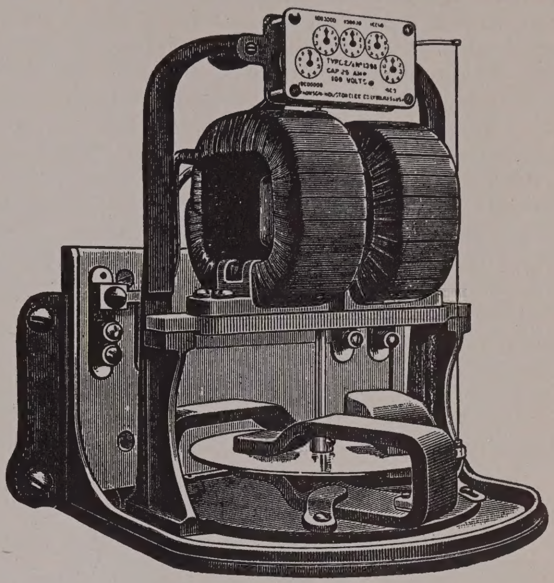
The incandescent lamp with the carbon filament, was perfected by Edison in 1878, and became a commercial success with the perfection of the dynamo. The lamp consists of a slender filament of conducting carbon inclosed in a highly exhausted glass bulb. The resistence of this carbon-filament, varying from a few ohms to several hundred ohms, is high compared with the resistence in the rest of the circuit, so that nearly all the energy of the circuit is used in producing heat in the filament to raise it to incandescence. The source of current is ordinarily the mains from a central electric station, but an isolated dynamo or a storage battery may be used. Most incandescent lamps are made with filaments which become white-hot under a pressure of 110 to 114 volts. The carbon-filament lamp has since 1910 been largely replaced by lamps having filaments of metallic tungsten. The tungsten filament can be safely raised to a much higher temperature than can the carbon filament, and the luminous efficiency is thus nearly three times greater than the efficiency of the carbon filament. The carbon filament requires normally about three watts per candle-power, while the tungsten takes only one and a quarter watts per candle-power. The efficient life of the lamp is also longer. The tungsten lamp is made in a great variety of sizes and shapes for different uses. For interior lighting it has practically replaced all other electric lamps, and in many places it is replacing arc-lamps for street lighting.

In what is known as the Nernst lamp, the incandescent body is a rod or filament of magnesium-oxide which is a poor conductor when cold but a good conductor when heated. To start it, it is necessary to apply a match or heat it electrically by means of a platinum wire. For the various methods of distributing incandescent lamps, see any treaties on electrical engineering.

Electric=Light Bug, a large water-bug common in the United States. The bugs fly readily from pond to pond. Formerly they attracted no general attention; but, since our cities have been lighted by electrical lights placed on high elevations, they are at times very common in cities. They fly into the electric light and are killed by hundreds and have been the occasion of frequent mention by the public press. They are not, however, of recent appearance in this country, as is sometimes supposed. They are true bugs, living in the water, with a sharp beak used for puncturing their prey. They attack snails, small fish and, occasionally, a frog, and suck the blood. They reach a length of more than two inches, and have long been known to observers of insects under the names giant water-bug and water-scorpion.

ELECTRIC BUG

Electric Meter, a piece of apparatus for measuring and recording the electric energy consumed in a circuit. Several forms of electric meter have been devised, but the only kinds in general use are the clock and the motor-meter. The clock-form of meter is much used in Europe, but not in the United States, In the Aaron meter, a clock-form, the pendulum of a clock has a magnetic bob, which swings over a coil carrying the current, and thus the change in the rate of the clock depends on the current. This change in rate is recorded on one or more dials, and these are graduated in electrical units. The only meters in general use in the United States are motor-meters. A motor-meter is a small electric motor so made that the number of revolutions of the armature is proportional to the electric energy consumed in the circuit in which the motor is placed. The total number of revolutions is recorded on a dial by a simple mechanism. The meter is usually incased like a gas-meter with only the dial visible. Electric meters record in some unit representing power multiplied by time, as watt-hour, measuring a watt of electric energy for one hour, or lamp-hour, measuring the energy required to run one 16-candle-power incandescent lamp for one hour. For incandescent-lighting circuits where the pressure remains constant, the meter need record only current (ampères), but on motor-circuits the meter must be a true watt-meter, that is, record pressure times current (volts × ampères).

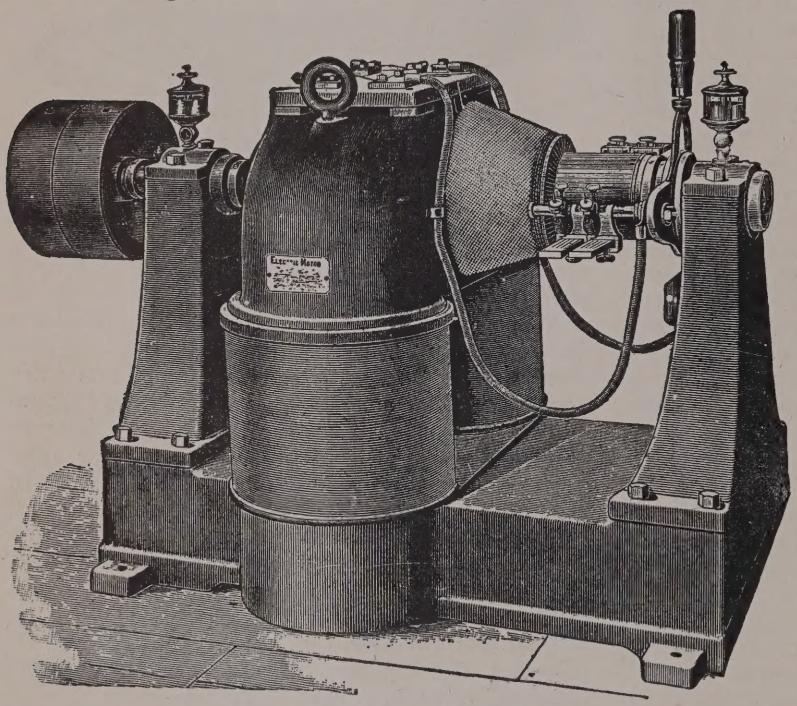


AN ELECTRIC METER

Meters are either for direct or for alternating circuits. A. C. meters are usually some form of induction-motor. (See Electric Motor.) Among the best-known electric meters are the Shallenberger, Thomson and Stanley meters. Meters are now used by most large central stations in measuring electric energy supplied for all purposes. The accuracy for their whole range of loads is within 2% for the best meters, while for mean loads the accuracy is much greater.

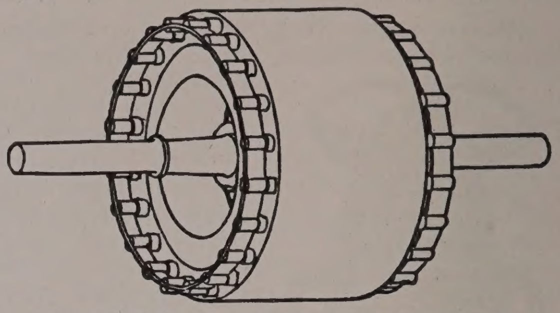
Electric Motor, a machine for transforming the energy of an electric current into mechanical power. The modern direct-current motor may be looked upon as a reversed dynamo. In fact, any direct-current generator will run as a motor if current is passed through its armature and field-magnets, and in general an efficient generator is an efficient motor. But not all electric motors are good generators, for motors are often constructed for special purposes. Thus the street-car motor, for obvious reasons, is made with light field-magnets. But the general description of a D. C. dynamo applies directly to a D. C. motor.

An alternating-current dynamo will run as a motor when supplied with the proper alternating current, provided it is first brought up to its normal speed as a generator. After that it runs synchronously with the generator, unless overloaded, when it will stop. Such a motor is called a synchronous motor. Synchronous motors have the disadvantage of requiring an auxiliary starting-motor. They are seldom used, except in very large plants where the load is required continuously. There are several long-distance transmission-plants in the Rocky Mountains using synchronous motors. All practical self-starting A. C. motors are induction-motors. This motor is based on a discovery of Professor Ferraris of Turin University, Italy, but the first commercial induction-motors were due to Tesla. The armature of an induction-motor is a closed coil without commutator, collector-ring, brushes or external circuit. The multipolar field-magnets are excited by two or more alternating currents which differ in phase. By proper windings and connections of the coils of the field-magnets, there is thus produced a magnetic field which changes both strength and direction, a so-called rotary field. This induces currents in the armature-coils, and carries the armature with it. Induction-motors are self-starting, are simple in mechanical construction, require little attention in operation and are efficient; but they require two or more separate currents to operate them. These currents, however, are generated by a single dynamo. Induction-motors at present are not adapted for purposes where the speed has to be varied, as on street-cars. For small motors, such as fan-motors, the two phases can be obtained by splitting a single-phase current, but this method has not been successfully used on large motors. Both two and three phases are used in A. C. motors.



A DIRECT-CURRENT MOTOR

The first persons to make practical use of electric motors were Jacobi, Davenport and Page. Jacobi ran a boat carrying 14 passengers at St. Petersburg in 1838. Davenport had an experimental electric railroad at Springfield, Mass., in 1835. Page ran a 16 H. P. electric locomotive at a speed of 19 miles per hour on the railroad between Washington and Baltimore in 1851. All obtained their electric currents from primary batteries. The first case of running a motor from a dynamo was that of Fontaine and Breguet, at the Vienna exposition in 1873. The distance between the generator and motor was over a mile. Electric motors are now used in every place where power is needed. The fact that in many shops electric motors are placed on each machine, the motor-efficiency being higher than that of shafts and belting, speaks for the efficiency of the modern electric motor. Additional information upon both the scientific and practical aspects of the generation and transmission of electrical power and its use in street railway systems will be found in the articles on TRANSMISSION OF POWER and the ELECTRIC RAILWAY. A. P. CARMAN.



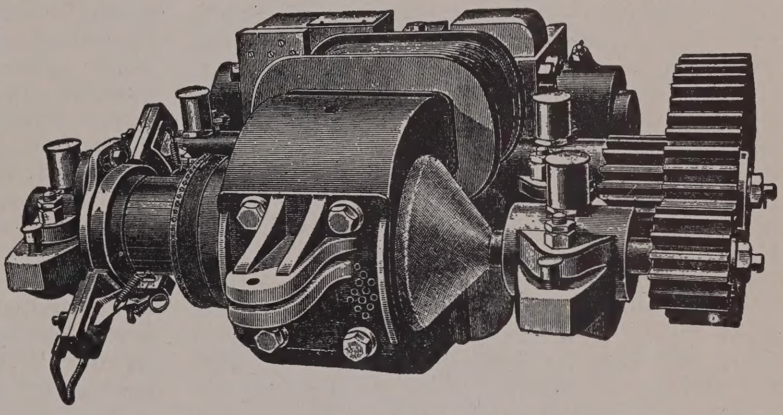
ARMATURE OF AN INDUCTION-MOTOR

Electric Railway, a railway using electric motors to move its cars. The first electric railway was a small line built by Thomas Davenport, at Springfield, Mass., in 1835. In 1851 Prof. C. G. Page ran a 16 H. P. electric locomotive at the rate of 19 miles per hour near Washington. The currents in the above cases were from primary batteries, too costly a source for commercial purposes. In 1879 Werner Siemens ran an electric railway 900 feet long at an exhibition held in Berlin; and two years later a line, 1½ miles long, was opened in a Berlin suburb. The currents were generated by dynamos. During the next few years various experiments were made with varying success. The first line which can be said to have been an engineering success was that put in at Richmond, Va., by F. J. Sprague in 1887, and most of the features that have been developed and used in our present street-systems of electric traction are found in Sprague's road. These features are one or two motors supported under the cars and geared to the axle; a switch and controller on the platform by which the speed and direction of the motor can be controlled; a single, overhead wire, suspended over the track by insulating supports, for bringing the current; a trolley-wheel carried on a pivoted pole from the car-top to connect the trolley-wire with the motor; a return-circuit through the rail and ground to the power-station. The currents are generally used at a pressure or potential of 500 volts. The current for the trolley-wire is carried by feeders, large wires, which run overhead (or underground in large cities) from the power-station, and are connected at various points with the trolley-wire. The return-currents through the ground have introduced most troublesome problems, owing to the electrolytic action on pipes for water and gas and on street-foundations. (See ELECTROLYSIS.) For means of suspension of motors from car, special trucks required, methods of control of motor-speeds, the question of lines and line-insulation and other special engineering problems that have been so successfully met, the reader must consult the technical books and journals.

The overhead trolley-wire has been replaced in some large cities by an underground conduit-system and for most elevated railroads by the third-rail system. The underground conduit-system is used in Washington, D. C., in New York city and in several European cities where the overhead wire was not considered safe, and not sightly. A small tunnel or conduit runs below the surface between the tracks, and in this is a slit for an arm which extends down from the car. The trolley-wire is carried on insulated supports in this conduit, and contact is made with it by brushes on the arm from the car above. The success of this system depends on the maintenance of insulation of the wire in the conduit, often a difficult problem owing to moisture and dirt, but successfully solved in the cities mentioned. The installation of the conduit-system is very costly, and pays only in large cities where the traffic is large. In the third-rail system an ordinary steel track-rail is carried on the insulators, supported on the wooden sleepers about a foot to one side of the track. This third rail takes the place of the trolley-wire. It has proved successful on elevated railways, as on those of Boston, New York and Chicago.

The electric railway has superseded horse and cable cars for urban and suburban travel. It was introduced in 1887. By 1890 there were over 2000 miles of track operated by electric traction in the United States as against 6000 by horses and 500 by cable. Twelve years later there were over 41,000 miles operated by electricity. The number of electric cars in the United States is estimated at 100,000. The capital invested in the industry is five billion dollars, and the revenue is $585,000,000. The power plants of some of the electric traction lines are the largest known. Single units generating from 20,000 to 30,000 K. W. are in use, Statistics show that the electric cars carry annually over 26,000,000 passengers per day in the United States. The electric railway systems have extended into the country-districts, making those districts residences for workers in the cities. They also form connecting lines between cities, in many cases carrying traffic that was formerly taken by the steam railroads.

For underground railroads in the cities and for tunnels, the electric system has not only the advantages of efficiency and economy, but the great advantage of producing no smoke. The underground roads in New York city and in London are operated by electricity. The use of electric power instead of steam for standard railroads has been much discussed. The railroad between New York city and New Haven with its heavy traffic has used electric power for several years. In 1918 the C. M. & St. P. Railway completed the electrical equipment of a division of 440 miles across the mountains in Idaho and Montana, replacing steam locomotives by electric locomotives for both passenger and freight service. The power comes from hydro-electric plants. The application of electric traction to trains of more than two or three cars requires a heavy electric locomotive or a special system of control for the connected motor-cars, so that the motors on each car can be controlled by one motorman. The only system in use is



A STREET-CAR MOTOR

the Sprague multiple-unit system. (See *Street Railway Journal, May, 1901*). The alternating-current motor is not used for street railway work, as it requires a double-trolley line and present forms present serious problems in speed regulation. Alternating motors are however in use in some special cases as in some heavy mountain railway lines in Italy. The storage battery was at one time used on a number of street-car lines, but the weight of the battery and so rapid deterioration under traffic conditions were disadvantages and it is not now used.

The power-plants of some of the electric railways are the largest known. The electric-railway systems have extended far out into the country districts, making those districts residences for workers in the cities. They also today form connecting lines between cities. For underground railroads the electric system has not only the advantages of economy and efficiency but that of producing no smoke. At present no long overland trunk-railroad is operated by electricity, although such schemes have been suggested. It is not a question of engineering but of finance, and high-speed. Heavy electric roads are likely to come when the traffic will support trains at short intervals. The application of electric traction to trains of more than several cars requires a large electric locomotive or a special system of control, so that the motors on each can be controlled by one motorman. A. P. CARMAN.

Electric Welding, the process ot welding two pieces of metal together by using the heat produced by an electric current. The process developed by Elihu Thomson is practically the only one used. In this the pieces to be welded are held in proper supports, and a large electric current at a very low pressure is sent through the joint from piece to piece. The passage of a large current causes a local production of heat in the metals on each side of the joint, and the metals are pressed together when at the proper temperature, a perfect weld being formed. Practically all kinds of metals can be welded in this way, and even different metals can be welded together, as copper and brass. Welds can also be made by this method in pieces whose shape would prevent welding by ordinary processes. The current used is an alternating current, often of thirty or forty thousand ampères and of correspondingly low pressure. Welding-currents are produced by a special transformer which forms part of the apparatus. The apparatus takes different forms, depending on the shape and size of the work to be handled. For joining two wires it has a very simple form, but for welding pipe or welding artillery-projectiles machines of special form are required.

Electrolysis. Volta, the inventor of the battery, showed that conductors of electricity may be easily divided into two different classes by considering their behavior while an electric current is passing through them. In one group of conductors, as iron, carbon, mercury, etc., we find that the current produces no change in the chemical composition of the body; while in the other group (which includes such bodies as solutions of table-salt, silver-nitrate, copper-sulphate, etc.) the current breaks up the salt, which is so dissolved, that at the point where the current enters the solution we get one constituent of the salt and at the point where the current leaves the solution we get the other constituent of the salt. Bodies which are not decomposed by the current, Volta called conductors of the first class; those which are broken up by the current, he called conductors of the second class. Sir Humphry Davy, in the first decade of the 19th century, established the fact that, when a current is passed through a solution, that solution is, in general, broken up into "two" other substances. It remained for Faraday, however, in 1834, to give an accurate description of the phenomena which accompany the passage of a current through a conductor of the second class. To Faraday, also, we owe the nomenclature of this subject. The wire by which the current enters the solution he called the anode; the wire by which it leaves he called the cathode; the solution itself was called the electrolyte; and the process of decomposition by an electric current was called electrolysis. The parts into which the electrolyte is decomposed are called ions. Faraday's most important discoveries are summarized in the two following laws:

I. "The amount (*i. e.* the mass) which is decomposed by an electric current is proportional to the current flowing and to the time during which it flows.

II. "When an electrolyte or a series of electrolytes is decomposed by an electric current, the components into which it is separated are always chemically equivalent *i. e.*, they are set free in just such amounts as may recombine and form a chemical compound without any left-over material."

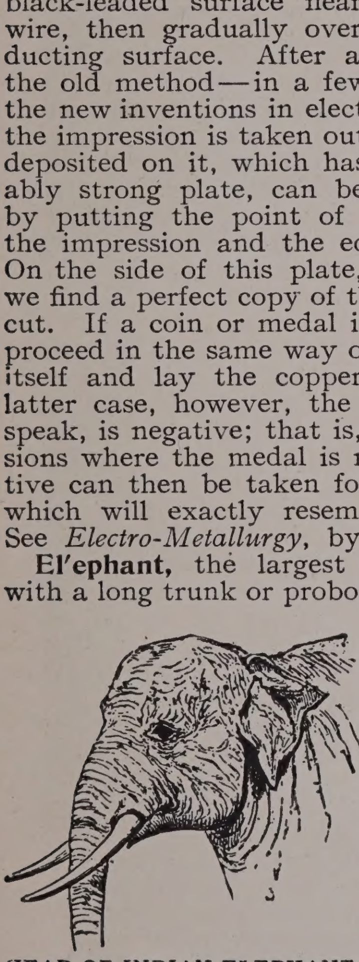
The applications of electrolysis in commerce are very numerous. Among the most important may be mentioned: (1) plating baser metals with gold, silver or nickel; (2) electrotyping, used in all kinds of printing; (3) the separation of metals, especially copper, from their ores; (4) in defining the legal unit of current, *i. e.*, the ampère; (5) in electro-glazing; (6) in the manufacture and charging of storage-cells. Within the last few years electrolysis has found an unfortunate though important application in the destructive effects of trolley-line currents upon the water-mains in our larger cities. When the return-current leaves the iron pipe and enters the moist ground, a certain amount of the iron is dissolved.

For an excellent brief account of this

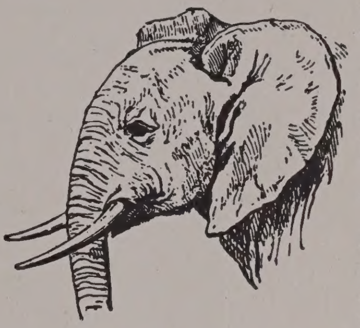
entire subject, see Hastings' and Beach's *General Physics.* Read Faraday's papers, in Harper's *Scientific Memoirs.*

Electron. (See Atom.)

Electrotype. The art of copying printing-type, wood-cuts, seals, medals, engraved plates etc. in metals, especially in copper, by means of a galvanic current, is called electrotyping. The process, briefly, is this: An impression of the thing to be copied is first taken in gutta-percha, sealing-wax, fusible metal or any substance which, when heated, takes a sharp impression. While this impression—say in gutta-percha—is still soft, a wire is inserted into the side of it. As gutta-percha is not a conductor of electricity, it is necessary to make the side on which the impression is taken conducting, and this is done by brushing it over with plumbago by a camel's-hair brush. The wire is next attached to the zinc-pole of a weakly charged galvanic battery, and a copper-plate is attached by a wire to the copper-pole of the cell; or the required current may be supplied by a dynamo-electric machine, as is now usual. Then the impression of the plate to be copied is dipped into a copper-solution. The copper of the solution begins to be deposited on the impression, first at the black-leaded surface near the connecting wire, then gradually over the whole conducting surface. After a day or two by the old method—in a few hours now with the new inventions in electrical machines—the impression is taken out; and the copper deposited on it, which has formed a tolerably strong plate, can be easily removed by putting the point of a knife between the impression and the edge of the plate. On the side of this plate, next the mold, we find a perfect copy of the original wood-cut. If a coin or medal is taken, we may proceed in the same way or take the medal itself and lay the copper on it. In the latter case, however, the first cast, so to speak, is negative; that is, showing depressions where the medal is raised; this negative can then be taken for a second copy, which will exactly resemble the original. See *Electro-Metallurgy*, by George Gore.

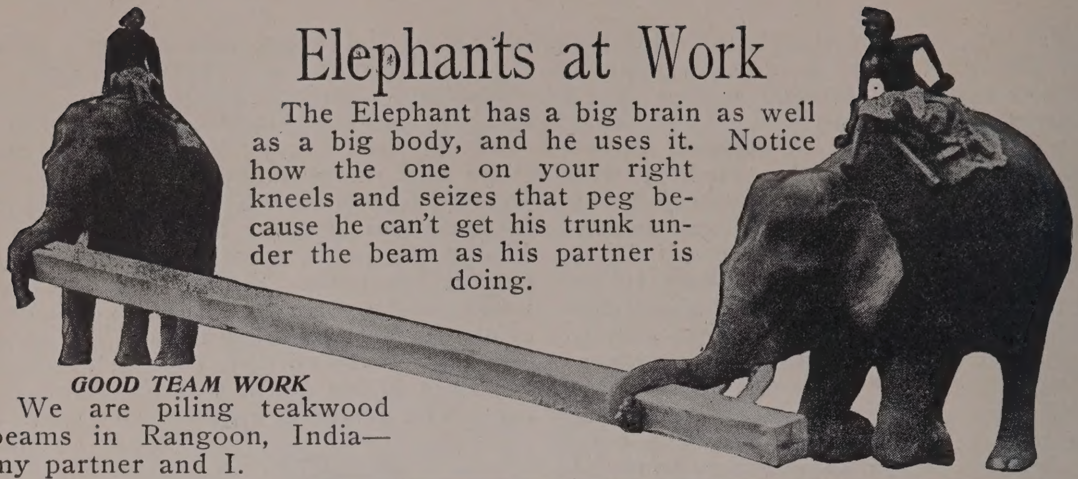

HEAD OF INDIAN ELEPHANT

El'ephant, the largest of land-animals, with a long trunk or proboscis, with nostrils at its extremity and with two upper teeth developed into tusks. There are two kinds now living: the African elephant, inhabiting the greater part of Africa south of the Sahara, and the Indian, found in the forest-lands of India and southeastern Asia, including the islands of Ceylon and Sumatra. These are distinct kinds. The African form is slightly higher, with a convex forehead and very large ears — about three and one half feet long by two and one half feet broad. Tusks are carried both by male and female. The Indian form has smaller ears, a concave forehead and tusks only in the male. Elephants may reach a weight of three or four tons, and a height of eleven feet or a little more. The famous Jumbo was eleven feet, two inches, and at the time of his death was not done growing. The trunk is an elongated nose and upper lip grown together. The nostrils are at the end, as is also a finger-like tip for grasping. It is very muscular and strong, and is put to many uses in feeding, drinking, spraying, lifting, etc. The tusks of the African elephant are of a better quality of ivory than those of the Indian. Large tusks weigh 150 pounds and may exceed that weight, but the average weight is about 28 pounds, and they sell for about $300 a hundredweight. Elephants have been so extensively hunted and killed for their ivory, that their number is being reduced. The Indian elephant is domesticated, and is used in lumber-yards for piling lumber and other heavy work. It is ridden by native princes and their friends. A large saddle with a canopy, holding several persons, is strapped on the back, and the driver (*mahout*) sits astride the neck and uses a goad and hook in controlling the animal. Asian elephants are also put to other uses, but principally on state-occasions and in tiger-hunting. The hunters shoot from the backs of the elephants, while the natives beat up the jungle to drive the tiger into sight. Elephants live to an age of 120 years. In their native haunts they eat shoots and twigs of trees, various kinds of grass, bamboo, sugar-cane, reeds, etc. The food of the African elephant is of a coarser variety — larger shoots, roots of trees and shrubs. The elephant also is fond of fruit. In captivity it is fed largely on hay and carrots. It has a long memory for friends and foes, revenging itself for tricks and insults. Asian elephants were used in war by ancient warriors. Egypt and Carthage domesticated the African elephant, and Hannibal used it in his wars. For extinct species of the elephant, see Mammoth and Mastodon. See Halder: *The Ivory King.*


HEAD OF AFRICAN ELEPHANT

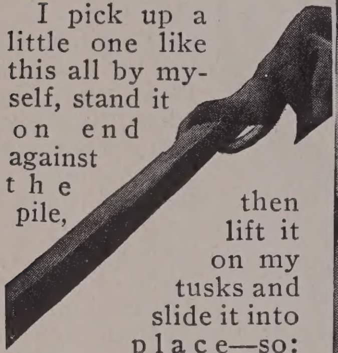
Elephants at Work

The Elephant has a big brain as well as a big body, and he uses it. Notice how the one on your right kneels and seizes that peg because he can't get his trunk under the beam as his partner is doing.

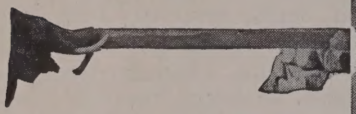


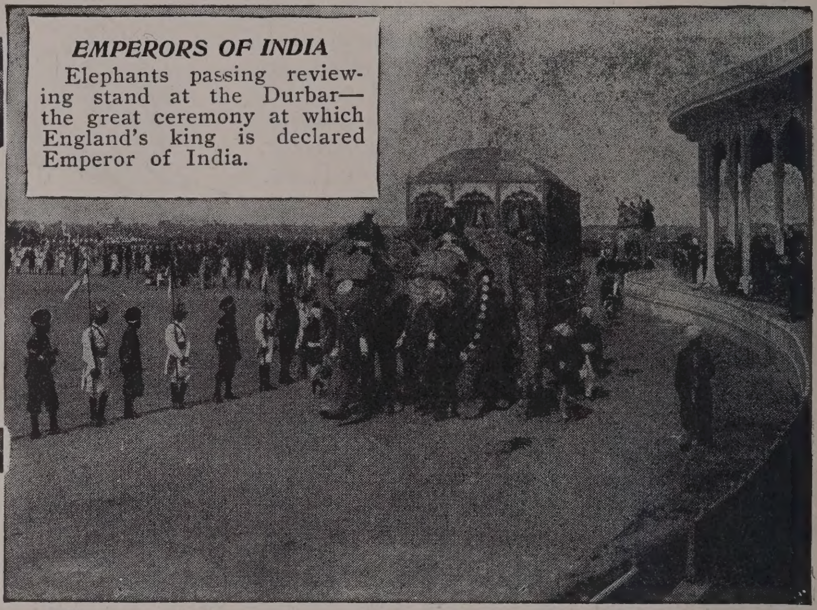
GOOD TEAM WORK

We are piling teakwood beams in Rangoon, India—my partner and I.



I pick up a little one like this all by myself, stand it on end against the pile, then lift it on my tusks and slide it into place—so:

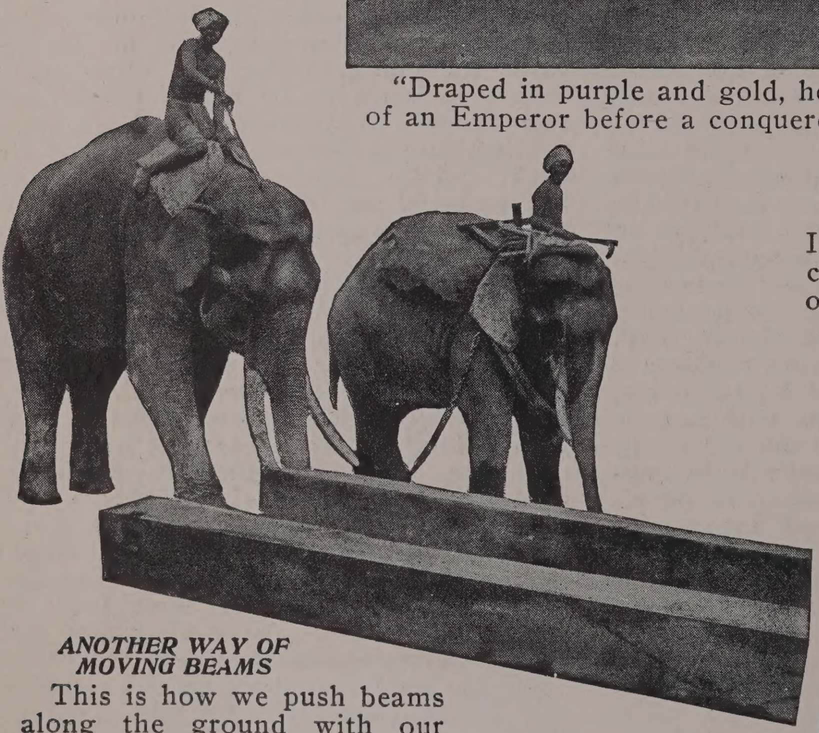




EMPERORS OF INDIA

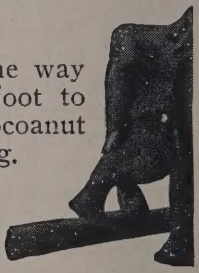
Elephants passing reviewing stand at the Durbar—the great ceremony at which England's king is declared Emperor of India.

"Draped in purple and gold, he walks with the tread of an Emperor before a conquered army."



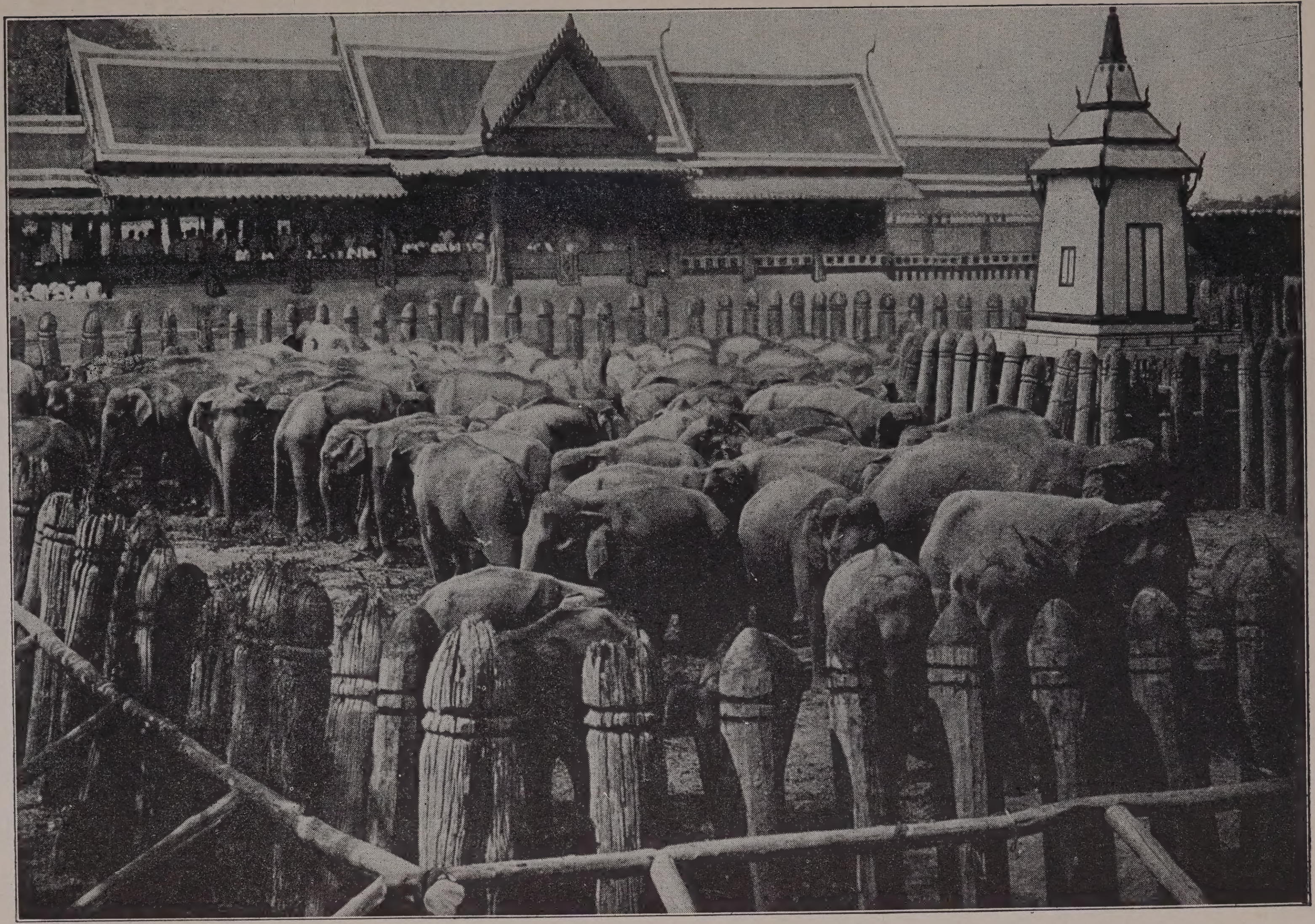
ANOTHER WAY OF MOVING BEAMS

This is how we push beams along the ground with our tusks. My partner is letting me be the whole show while you are watching us.



This is the way I use my foot to crack a cocoanut or roll a log.

And this is how I roll great big logs in the forest.



A HERD OF WILD ELEPHANTS

Captured and placed in a strong pen. After they have become somewhat tamed they are lassoed and taken out separately.

Eleusis (*ê-lū′sĭs*), next to Athens the most important city of ancient Attica. It was situated on the Bay of Eleusis, opposite Salamis, and was connected with Athens by the Sacred Road. It was famous as the chief seat of the worship of Ceres (Demeter), whose mystic rites — the Eleusinian mysteries — were here performed with great pomp and solemnity from the earliest times (B. C. 1356?) till Alaric, the leader of the Goths, destroyed the famous temple of the goddess in 396 A. D. The site of the old city is now occupied by the little village of Leusina. Excavations since 1882 have revealed many remarkable ruins.

El′eva′tor, a machine for carrying passengers and freight from story to story in buildings. It consists of a car more or less open, which is raised and lowered in a suitable shaft in the building. Elevators may be moved by hand or by mechanical power. The power used is hydraulic, steam or electric power. In hydraulic elevators the power is due to the water-pressure acting on a piston working in a cylinder. Hydraulic elevators are of the ram or the suspended type. In the ram-type the car or platform is carried on a vertical rod that is attached directly to the piston of the water-cylinder. The length of the cylinder is thus the same as that of the extreme height to which the elevator rises. Such elevators are used in Europe. They are safe, but very slow, and not adapted to great heights. In the suspended type of hydraulic elevator the piston only works through a short distance, but this motion is multiplied by an inverted block-and-tackle which raises the elevator. In steam and electric elevators the wire-rope which raises the elevator-car is wound about a drum, which is revolved by the steam-engine or the electric motor. The elevator is controlled from the car by ropes or rods which act on the valves of the hydraulic cylinder or on the starting and stopping devices of the engine or motor. Various safety-devices are used to prevent a fall of the elevator-car in case of the breaking of the rope, and accidents seldom take place. Elevators are an absolute essential to the modern tall building in the city. The speed used in elevators is several hundred feet per minute, and they can be used for any height. The elevator in the Washington monument runs 500 feet. This is one of the highest elevators in the world.

Elgar, Edward William, a prominent English composer, was born at Broadheath, near Worcester, on June 2, 1857. His *Dream of Gerontius* brought him great fame in 1900. This has been maintained by the large works that have followed: *The Apostles* and *The Kingdom.* The list of his orchestral and smaller compositions is considerable, and has aided in placing him in the first rank of contemporary composers.

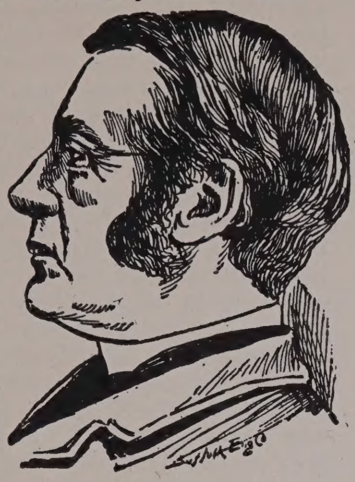
Elgin (*el′jĭn*), a city in Kane County northwestern Illinois, on Fox River, 36 miles northwest of Chicago. It has a large dairy-business, with extensive milk-condensing factories, supplying Chicago with butter and other dairy-products. It has large manufactories of carriages, shoes, farming-implements and washing-machines. Its other industries include meat-packing establishments, cotton-mills, soap-factories, etc. It is best known, however, as the seat of the watch-works, which employ 3,000 workmen and produce 1,800 watches daily. It was one of the first watch-factories in the United States, and the Elgin with other American watches has largely taken the place of foreign watches in the trade. The Northern Illinois Hospital for the Insane is at Elgin. There are excellent public schools, many handsome churches and a public library. Elgin is located on an extensive system of interurban electric lines. Population, 30,000

Elgin Marbles, a celebrated collection of ancient sculpture brought from Greece (1801-03) by the Earl of Elgin, then English ambassador to Turkey. The British Museum obtained them from him in 1816 for about $175,000. The sculptures adorned certain buildings on the Acropolis of Athens, which then was a Turkish fortress. The chief portions, which are from the Parthenon or Temple of Minerva, were designed by the great sculptor Pheidias. At the time of their removal a fierce controversy arose in England as to Lord Elgin's right to take them from Athens. Lord Byron considered their removal very unjust, and his view was shared by many. See Newton's *Contents of the British Museum, Elgin Room.*

Elia. See LAMB, CHARLES.

Elias or **Eli′jah,** the greatest of the prophets of Israel, flourished about 900 B. C. The Bible tells how God, through him, imposed a three years' drouth upon the northern kingdom; how he was fed by ravens; how he challenged the pagan priests at Mt. Carmel to bring down fire from heaven to consume their sacrifice; and how he was later taken up to heaven in a chariot of fire. He was an uncompromising upholder of the Hebrew faith against idolatry, especially against the Baal-worship brought from Phœnicia by Jezebel, and saved the purer religion from destruction and corruption. Like Moses and Samuel, he was statesman as well as prophet, ordaining new kings for Israel and Syria and appointing Elisha his prophetic successor. The Jews of later times expected Elijah to return to announce the coming of the Messiah, and the prediction of his return is declared in the New Testament to have been fulfilled in John the Baptist. Elijah also appears with Moses on the Mount of Transfiguration. His story is a favorite with artists. See *Kings I* and *II* and *Elijah* by Dr. Milligan.

Eliot, Charles William, LL.D. president of Harvard University, was born at Boston, Mass., March 20, 1834, and educated at Harvard. He began his educational career as tutor in mathematics in his *alma mater* and later became professor of chemistry at Harvard and at the Massachusetts Institute of Technology. In 1869 he was chosen president of Harvard, where his influence on educational thought has been great. He resigned in 1908, to take effect in 1909. In conjunction with F. H. Storer he published *Manuals of Qualitative Chemical Analysis* and *Inorganic Chemistry.* He has also published *Educational Reform* and *Five American Contributions to Civilization.* He died in 1926.



CHARLES W. ELIOT

Eliot, George, the name by which the great English novelist, Marian Evans, is known. She was born in Warwickshire, Nov. 22, 1819. Her father was a man of strong character, and after her mother's death in 1836 Marian took charge of the house. She was well - educated, and was a wide reader. When she was just of age, her father removed to Faleshill Road on the outskirts of Coventry. Here she became acquainted with Charles Bray, the author of several works in philosophy, and formed a close friendship with his wife and her sister and brother, Sarah and Charles Hennell. Through their influence she began to give up her early belief in Christianity. In 1846 she published a translation of the German writer Strauss' *Life of Jesus*, and she later translated other philosophical works. In 1850 she began to write for the *Edinburgh Review*, and next year became its assistant-editor. Her first stories, *Scenes from Clerical Life*, appeared in *Blackwoods' Magazine* in 1857, and at once gave her a wide reputation. Two years later she published *Adam Bede*, which fixed her place among the greatest English novelists. This was followed by *The Mill on the Floss, Silas Marner, Romola, Felix Holt, Middlemarch* and *Daniel Deronda.* Of her poetry, *The Spanish Gypsy* and *The Legend of Jubal* are well-known, though they do not rank with her prose-works. As a novelist George Eliot is specially noted for power in describing the growth of character. Her subjects are all representatives of distinct traits of character. Her first husband, the author G. H. Lewes (q.v.), died in 1878. She married John Cross in 1880, but died December 22nd of the same year. See *Life of George Eliot* by J. W. Cross and R. H. Hutton's *Modern Guides of English Thought.*

GEORGE ELIOT

Eliot, John, "the Apostle to the Indians," was born in Hertfordshire, England, in 1604, the son of a yeoman; graduated at Cambridge in 1622; and went to Boston in 1631. In 1646, after two years' study of the Algonquin language, the tongue of the Indians of Massachusetts, he preached a long sermon to the Indians near Roxbury, and other meetings followed. At one time there were over a dozen townships of "praying Indians" in Massachusetts, and many more outside, numbering 3,600. Eliot, with two others, prepared the *Bay Psalm Book*, which appeared in 1640, and was the first book printed in America north of Mexico. He made several translations of English religious books into the Indian tongue, but his greatest work was his Indian Bible. He died at Roxbury, Mass., on May 21, 1690. See *Life* by C. Francis in Sparks' *American Biography.*

Eliot, Sir John, English statesman was born at Port Eliot, England, on April 20, 1592, the son of a country gentleman of Cornwall. While traveling in Europe he met Villiers, afterward Duke of Buckingham. As an adherent of the duke he entered Parliament in 1624. But in the next parliament he broke with him, owing to the refusal of Buckingham—at that time the favorite adviser of King Charles I — to acknowledge the house of commons as the real ruling power in the nation. Eliot became the leader of Parliament against the encroachments of the king on its rights, and this policy at last brought about the impeachment of Buckingham. For this Eliot was imprisoned in the Tower for nine days. In the Parliament of 1628 his voice was raised against taxation by the crown without consulting Parliament, and it was mainly through him that the famous *Petition of Right* was extorted from Charles. He was sent to the Tower in 1629, and died there on Nov. 27, 1632. See *Life* by John Forster.

Eli'sha, a prophet of Israel, the successor of Elijah. He prophesied for 55 years.

Receiving the mantle of his master when he was taken up into heaven, he was recognized by the other prophets as their head, and was held in reverence throughout his whole life by the Israelites. His history is told in the second book of *Kings*.

Eliz'abeth, county-seat of Union County and formerly the capital of New Jersey, is situated five miles from Newark. Its trade has access to the sea through Elizabethport, on Staten Island Sound. It is the seat of a large Singer sewing-machine factory, and also has manufactories of oilcloth, mill-machinery, stoves, harness, pottery, ironware, hats, combs, etc. Elizabethport ships large quantities of coal, and here are located the shops of the Central Railroad and the Crescent Steel Works and Shipyard. The city has a business-college, two high-schools and 11 grade-schools. A drawbridge over the sound, 800 feet long, joins New Jersey with Staten Island. Population, 110,000

Elizabeth, queen of England, was the daughter of Henry VIII and Anne Boleyn, his second wife, and was born in Greenwich Palace Sept. 7, 1533. Her mother was beheaded when she was not yet three years old, and her father married Jane Seymour. Her early years were passed mainly with her governess and teachers, among them Roger Ascham and Sir John Cheke, under whom she learned to read Latin and Greek, to speak French and German with ease and to acquire what little music was then known. Two of her stepmothers, Anne of Cleves and Catherine Parr, were quite friendly to her, and Catherine would have had her much at court had it not been for Henry's dislike to his daughter. But till the death of her sister Mary, when she herself became queen, she had little to do with court or politics. Some of Elizabeth's teachers had been Protestants, and, as she was known to be such herself, Queen Mary suspected her of being concerned in Wyatt's rebellion in 1554, and she was thrown into the Tower. Afterward she was kept strictly guarded in Woodstock, and her worshiping with the Catholics was probably all that saved her from being sent to the block. On the death of Mary on Nov. 17, 1558, Elizabeth, then 25 years old, was summoned to the throne amid the rejoicings of the Protestants and many moderate Catholics. She at once saw that her part in European politics must be that of a Protestant sovereign. The great blots upon her reign are the persecution of the Catholics and the beheading of Mary, Queen of Scots. There is no doubt that Elizabeth was very jealous of Mary's beauty and attractiveness, though she was also prompted to the act by the discovery of designs against her life, such as the Ridolfi plot. The glory of Elizabeth's reign, on the other hand, is the destruction of the Spanish Armada in 1588. When an army gathered at Tilbury for the defense of England, she showed the courage of her race and made a ringing and patriotic speech to her troops, but the real credit for saving the nation is not hers. She was the last to believe that the Armada was really coming, and was so penurious in fitting out and provisioning the navy that she risked defeat and prevented the victory which was won from being as complete as it otherwise would have been. The real credit is due to the skill and courage of the great English captains of the time and to the generous gifts of English merchants. Elizabeth, however, showed both sense and shrewdness in her choice of the ablest men of the kingdom as her ministers. "The golden days of good Queen Bess" form one of the greatest periods of English history — the period when Great Britain became a world-power.

Elizabeth never married, but it was not for want of suitors. Philip of Spain, who had married Mary; Eric, king of Sweden; Henry III of France; Henry of Navarre; and Archduke Charles of Austria were some of her professed admirers. It is curious that more than any of these kingly suitors she liked the duke of Alençon; although, when they first met, she was 38 and he was 19 and a dwarf, with a face horribly disfigured by smallpox. But her heart was most deeply touched by Robert Dudley, Earl of Leicester, master of the horse, handsome and clever, husband of ill-fated Amy Robsart. The next favorite was the equally ill-fated Earl of Essex. But Elizabeth alternately loved and scolded him, seeming to care for him more as a mother cares for a spoiled child. When Essex was beheaded for rebellion, in 1601, she does not seem to have shown much grief. Elizabeth's love of dress is notorious. A German traveler who saw her going to chapel when she was in her sixty-fifth year, says: "She had pearls with rich drops in her ears, wore false red hair, had a small crown on her head, her dress white silk bordered with pearls the size of beans, a collar of gold and jewels." When young, she was noted for her abundance of auburn hair and delicate white hands, but her face and manners were almost masculine Elizabeth died on March 24, 1603. See *Queens of England* by Strickland; Creighton: *Queen Elizabeth;* and Hassall: *The Tudor Dynasty.*

Elizabeth, Pauline Ottilie Luise, queen of Rumania, was born at Neuwied on the Rhine, Dec. 29, 1843. As a writer she is best known by her pen-name, Carmen Sylva, under which she published *Sappho*, *Storms*, *Pilgrim Sorrow*, *Some One Knocks*, *Hammerstein*, *Jehovah*, etc. In 1869 she married Prince Charles (King

Carol I) of Rumania, and with her marriage she began to take an enthusiastic interest in Rumania, especially when its independence of Turkey was proclaimed, and it was erected in 1879 into a kingdom. In 1881 she and her consort came to the throne, and in that year she published *Pensées d'une Reine*, and some years later she issued a collection of her lyric poems. In her kingdom she was deemed the mother of her people. She died March 2, 1916.

Elizabeth, Saint, daughter of Andreas II, king of Hungary, was born at Presburg in 1207. When four years old, she was promished in marriage to Louis IV, landgraf of Thuringia, and was brought to his court in the Wartburg, to be raised under the eyes of her future husband's parents. She early became passionately devoted to the Christian life. She despised pomp, and tried to be humble, and was most self-denying in her gifts to the poor. The marriage took place when she was but 14, and six years later Louis died as a crusader, while at Otranto. Great misfortunes soon befell the saintly landgravine. She was deprived of her regency by her husband's brother, and driven out of her kingdom on the ground that she wasted the state-treasures by her charities. At last she found refuge in a church, where her first care was to thank God that He had found her worthy to suffer. After other trials, such as being forced to take up her abode in the stable of an inn, she was received into a monastery by the abbess, who was her aunt. When the warriors who had gone with her husband on the crusade came back from the east, she gathered them around her and recounted her sufferings. Steps were at once taken to give her back her rights, but she refused again to be regent and would only take the revenues that belonged to her as landgravine. She was allowed to go back to her castle at Marburg, but in her humility she lived in a cottage at the foot of the hill on which it stood, donning the nun's dress and spending all her life and all that she had in relief of the poor, earning with her own hands what little she needed for herself. She died on Nov. 19, 1231, and four years later was added to the number of the saints by Pope Gregory I. For ages her shrine was one of the most famous in Europe, and the altar-steps before it are worn hollow by the knees of pilgrims. Even during her life many miracles were connected with her name. The best-known story is that of the basket of roses. Against her husband's command she carried a basket of food to a poor family. On the way she met her husband, who sternly ordered the basket to be opened. Frightened and trembling. she obeyed, only to find in answer to her prayer the basket filled with beautiful roses. See Kingsley's *Saints' Tragedy*.

HEAD OF ELK

Elk or **Moose,** the largest living deer common to the Old and New World in northern regions. In the New World it is found mostly in northern Maine and British North America. It has long legs, standing about six feet high, a large head with broad muzzle and large nostrils, but can be distinguished from all other deer by the horns or antlers of the male, each of which is in two parts, like a broad hand with the palm curved and held upward; around the margins are prongs or snags. An average full-grown pair, with the skull, weighs 70 pounds. They grow gradually; the first year being only knobs an inch high, the second year they are about a foot long, and the third year are palm-shaped. The fully formed horns are shed in December, and sprout again in April, reaching their full size in June. It is remarkable to think of these enormous horns being shed annually and produced again in so short a time. The moose feeds on willow-tips, the tender shoots of the striped maple and other trees, bark and various evergreens Moose are rapid runners, and, having sharp senses of hearing and smell, are difficult to hunt. In winter they herd in small troops for protection. Remains of an extinct elk of gigantic size are found in the peat-bogs of Ireland. This Irish elk held its antlers ten feet high, and they measured 11 or 12 feet from tip to tip. In America the wapiti is often wrongly called the American elk. See Edward's *Campfires of a Naturalist*.

Elkhart, Ind., a city of central northern Indiana, capital of Elkhart County, 20 miles east of South Bend and 100 east of Chicago. It lies at the confluence of the St. Joseph and Elkhart Rivers, and is the junction of a number of railroads. These advantages make it a good shipping-point and attractive manufacturing city. The town was founded early in the thirties, and incorporated in 1875. Here are located the locomotive-shops of the Lake Shore Railroad, foundries, planing-mills and factories. Among its manufactories are paper-mills, carriage and musical-instrument establishments, the largest band-instrument factory in the world being here. The city has 30 churches and ten schools, and is a modern, progressive, business city. Population, 30,000

Elkins, Stephen Benton, American politician, was born in Perry County, Ohio, Sept. 26, 1841, and was educated in Missouri, where he began the practice of law. In 1863 he settled for a time in New Mexico and became member of the territorial legislature, attorney-general, United States district-attorney and delegate in Congress from New Mexico. He subsequently removed to West Virginia and became interested in railroads and in coal-mining. He was appointed secretary of war in the Republican administration of President Harrison, and later became United States senator from his state of West Virginia.

Ellice (*ĕl'lĭs*) or **Lagoon Islands, The,** were discovered by Capt. Peyster, an American, in 1819. They lie north of Fiji. The principal islets include Sophia (Rocky) Island and the Nukulaelae (Mitchell) group. The entire group has a population of 2.400 on 14 square miles of land. It is under the jurisdiction of the high-commissioner for the western Pacific, whose headquarters are in Fiji.

Elm (genus *Ulmus*), an important tree of temperate climes. The English elm is one of the chief timber-trees of the British Isles and is highly valued for its beauty. Comparing it with the American elm, it is a stockier tree and of less grace. The American or white elm is a tree dear to all familiar with New England, and is famous in our history. Every schoolboy has read of the Washington elm at Cambridge, Massachusetts, under which Washington stood when he took command of the American army, and of the elm under which William Penn made treaty with the Indians. It is a magnificent tree, sometimes towering 125 feet, its height and its great, arching limbs presenting a most stately and graceful appearance. In New England the long arms reach quite across the wide roadway. The New England elms veritably are a race of giants. The bark is gray and rough; the leaves, from two to six inches long, are alternate, obovate, and make pleasant but not too heavy foliage; the flowers, inconspicuous and greenish red, appear in March; the fruit is small, winged, green seeds. The tree is of rapid growth, its distribution being from Newfoundland to Florida and west to the Rocky Mountains. A great pity is the troop of insect-destroyers that are doing their best to lower the pride of the stately tree; the tussock-moth, elm-beetle and brown-tail greatly marring its beauty.

WHITE ELM

The slippery elm is a tree beloved of the "chewer," who, by the way, works it much harm in his effort to get at the fragrant inner bark, the cambium that in the spring is so inviting and refreshing. Druggist as well as small boy appreciates its virtues, keeping on his shelf various preparations made therefrom. The slippery elm, moose or red elm, is a quick-growing tree, rises 60 to 70 feet, and has a broad, flat head and spreading branches; the bark is rough and reddish-brown; the leaves are alternate, broadly oval, and from four to seven inches long. The tree grows fast and vigorously when not too ruthlessly attacked, but is becoming scarce.

The rock, cork or hickory elm has the typical elm-leaf but not the characteristic grace of the family. It has a corky bark, bears flowers and fruit in racemes; grows from 60 to 90 feet high, and has a round-topped head and stiff branches. The wood is hard and highly valued by the wheelwright. This elm thrives in lower Ontario and Michigan, and is found in scattered localities from Vermont to Tennessee and west to Nebraska. See Rogers: *The Tree Book;* Lounsberry: *A Guide to the Trees.*

Ellora, a village of Hindustan, celebrated for its wonderful rock-hewn temples. Of these there are 34 of a large size. Some are cave-temples proper, that is, chambers cut out inside of the rock; but others are buildings hewn out of the solid granite of the hills, having an outside as well as an inside architecture. In cutting the latter, a deep trench or pit is dug around a square, leaving a central mass standing, which is then hewn and excavated into a temple. The Hindu temple called the *Kailas,* is the most beautiful of all. It forms a pyramid, and is overlaid with sculpture. It is believed that the caves date from the seventh century.

Elmi'ra, New York, the county-seat of Chemung County, is on Chemung River, 149 miles from Buffalo. It has manufactories of iron-rails, railroad-cars, carriages, flour, leather, woolens, boots and shoes, steel-plate works, glass-works, rolling-mills, steel-bridge works, hard-wood finishing-works, etc. The city is in a fertile region, and there are stone-quarries in its vicinity. Here are located Elmira College, a state-armory, Arnot-Ogden Memorial Hospital, Steele Memorial Free Library, a government-building and various charitable institutions. Elmira has a fine park-system and all the adjuncts of the modern city. Population, **50,000**

El Paso, Texas, the county-seat of El Paso County and the northwestern gateway into Mexico, is situated on the Rio Grande River, on the southern boundary of New Mexico. Five of the great lines of railway-travel center here, but connect with the Pacific coast and the Mexican capital. The city has a high elevation and a mean annual temperature of 63° F. Near by are extensive salt-deposits as well as minerals. The United States government maintains a military post here. The population, which is a mixed one, including a number of Mexicans, Indian half-breeds, etc., numbers 90,000

Elves. See Fairies.

Elwood, Ind., a rapidly growing town in Madison County, central Indiana, 40 miles northeast of Indianapolis, is on the Lake Erie and Western and other railroads. It is a shipping point for grain and live-stock, and has a rapidly developing trade. Its manufacturing industries include saw and stave-mills, flax-factories and establishments for the manufacture of window, plate-glass and lamp-chimneys, flour and tin-plate mills, etc. It is surrounded by an agricultural region, and is in a natural-gas belt. The population within the past 20 years has risen from 2,284 to 11,028.

Ely, a town in Cambridgeshire, England. Here, in 673, Saint Etheldreda founded a mixed monastery, which, burned in 870 by the Danes, was refounded in 970 as a Benedictine abbey. In 1083 the first Norman abbot laid the foundation of the present church, which was made a cathedral in 1109, and, as we see it to-day, is one of the finest shrines in Christendom. Built in the form of a cross, it offers examples of all styles of Gothic architecture and is a growth of more than four centuries. Population of Ely, 9,000.

Ely, Richard Theodore, an American professor of political economy, was born in April, 1854, and studied at Columbia University and at Heidelberg. He was professor at Johns Hopkins from 1881, and at Wisconsin from 1892. Professor Ely believes in public ownership of such utilities as the telegraph and railway systems. While not a socialist, he is friendly to labor, and was even accused in 1894 of aiding a strike, but was acquitted. He is the author of several books, the latest and largest being his *Distribution of Wealth.* Others are *French and German Socialism in Modern Times*, *Socialism and Social Reform* and *Social Aspects of Christianity.*

Elyria, Ohio, a county-seat of Lorain County, 25 miles from Cleveland. The surrounding country is agricultural, but in the vicinity there are sandstone-quarries, which provide employment for many people. Among the industries are the manufacture of iron and steel-products, automobile-supplies, saddles, bicycles, etc. Population, 25,000

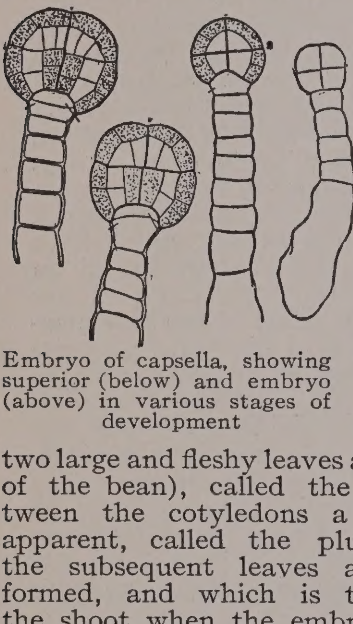
Eman'cipa'tion Proclamation. After the Civil War had been in progress for more than a year, the antislavery leaders in the north urged President Lincoln to take action toward the abolition of slavery. While personally opposed to slavery, the president was slow to take so important a step until it should appear to be necessary in order to save the Union. Replying to the suggestions, he said, on Aug. 22, 1862: "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing any slave, I would do it; if I could save it by freeing all the slaves, I would do it; and if I could save it by freeing some and leaving others alone, I would do that." At length it became evident that slavery was a source of military strength to the Confederate cause, since slave-labor provided the means of supporting the Confederate forces in the field, and that it must be destroyed if the Union was to live. Accordingly, on Sept. 22, 1862, the president issued a preliminary proclamation, giving notice that on the 1st of January, 1863, "all persons held as slaves in any state, the people whereof shall then be in rebellion against the United States, shall be then, thenceforward and forever free." No attention was paid to this notification, and on the first day of January, 1863, President Lincoln issued the final proclamation of emancipation, declaring free all persons held as slaves in the states then in rebellion. This proclamation was given effect as fast as territory came under Federal control. The effect of the proclamation on the legal status of the slaves gave rise to some discussion, but it was unnecessary to solve that problem as the work of emancipation of the slaves in the United States was completed with the adoption of the Thirteenth Amendment to the Constitution. The reconstruction of the Confederate states as parts of the Federal Union proceeded upon that basis.

See Slavery; Reconstruction in the South.

Emanuel I, king of Portugal, called the Great or the Fortunate, was born on May 3, 1469, and became king in 1495. His reign is known as the golden age of Portugal. He prepared the code of laws which bears his name, and made his court a center of chivalry, art and science. Vasco da Gama's voyage round the Cape of Good Hope, Cabral's discovery of Brazil and the expeditions of Albuquerque and others, that so widened Portuguese possessions, were all sent out and encouraged by Emanuel. It was he that made Portugal the first naval power of the world as well as its great commercial center. He died at Lisbon on Dec. 13, 1521.

Embalming. See Mummy.

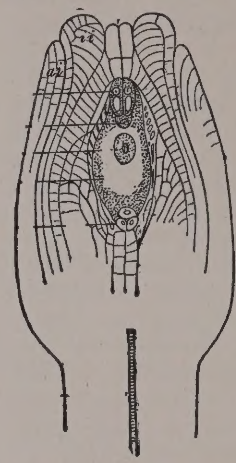
Embargo, a governmental decree limiting or restricting foreign trade. It may apply to specific ports or all the ports within the jurisdiction of the government. It may affect certain classes of goods or all goods. It may interdict only trade with one or more countries, or with all countries. It may prohibit vessels and goods from entering or leaving the nation's ports or merely one or the other. The United States passed an Embargo Act in 1794 in retaliation for the British orders-in-council of 1793. Both France and Great Britain had tried to cripple each other by declaring that neutral vessels carrying to either were the lawful prize of the other. The United States attempted to bring the two nations to terms by preventing her own vessels from trade. This country, however, was the greatest sufferer. The embargo was removed, but a non-intercourse Act took its place in 1809. War broke out with England in 1812, and a new embargo was levied until 1814. Under The Hague Convention, ships in an enemy port when war is declared must be allowed to leave before an embargo is levied.



Embryo of capsella, showing superior (below) and embryo (above) in various stages of development

Em'bryo (in plants), a plant in the earliest stages of its development. In *Spermatophytes* the name is restricted to the development within the seed. Taking the bean embryo as an illustration, it consists of a small stem, once called the caulicle, but now known as the hypocotyl, from the lower end of which the root develops, and at the upper end two large and fleshy leaves appear (the halves of the bean), called the cotyledons. Between the cotyledons a little bud is apparent, called the plumule, in which the subsequent leaves are more or less formed, and which is to develop into the shoot when the embryo escapes from the seed. Such an embryo represents the common form among the dicotyledons. Among the monocotyledons, as in corn, the same parts appear, but the single large cotyledon is terminal on the hypocotyl, and the stem tip comes out at one side. Among the conifers, as in pines, a rosette of cotyledons may appear, in the center of which is the plumule. In the development of the embryos of seed-plants a temporary organ, called the suspensor, usually appears. It generally is a more or less elongated filament of cells, which at its tip bears the cell which is to form the real embryo, and by its growth places this cell in a better position in reference to the food-supply which is forming in the seed. John M. Coulter.

Embryology. See Development.



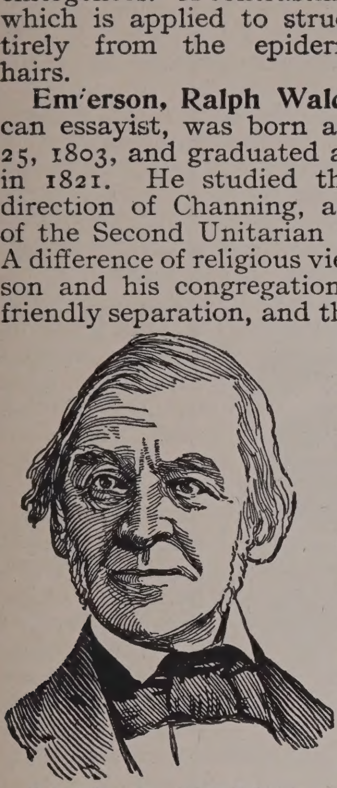
SECTION OF OVULE

Em'bryo-Sac (in plants). In the ovule of angiosperms there is developed what appears to be a large cavity, but is really a single large spore which is not discharged (see Megaspore). This spore germinates and develops within itself a very simple gametophyte consisting of seven cells (see Gametophyte). This spore containing its gametophyte, before it was known to be a spore, was called the embryo-sac, because the embryo was observed to develop within it. At one end of the sac three of the seven cells are grouped together, the group being called the egg-apparatus, since the central cell is the egg, which is to produce the embryo, and the other two aid it in the process of fertilization. At the opposite end of the sac is another group of three cells known as the antipodal cells. Usually they disappear very soon after they are formed. In the central region of the sac a very large cell appears, called the definitive nucleus or endosperm nucleus. It is this cell which produces the endosperm or food-cells for the use of the embryo. In many seeds, as corn and wheat, it is the endosperm which supplies the food-material used by man

Emerald, a mineral differing in nothing but color from beryl The emerald is highly esteemed as a gem. It owes its value mainly to its very beautiful velvety-green color. It is found in very few places. The finest have long been brought from Colombia, where they are got from veins in slate and granite. Valuable stones also come from the upper Orinoco in Venezuela. Poor stones are found in Europe, in Salzburg and the Ural Mountains, and some old mines in Egypt yield them. The gem was known and highly prized in early times. Ptolemy offered a famous poet, who visited his court, an emerald set in gold, with his portrait engraved on it. Nero, who was near-sighted, looked at the combats of gladiators through an eyeglass of emerald. An emerald is rarely without a flaw, and its value depends on its color. A very perfect emerald of six carats has been sold for $5,000. The name of oriental emerald is often given to a very rare, beautiful and precious green sapphire.

Emer'gence (in plants), outgrowths from the surface of a plant, such as warts, prickles, etc., which involve in their origin the cortex as well as the epidermis. For example, the stem-prickles of the rose are emergences. A contrasting term is trichome, which is applied to structures derived entirely from the epidermis, as ordinary hairs.

Em′erson, Ralph Waldo, a great American essayist, was born at Boston, on May 25, 1803, and graduated at Harvard College in 1821. He studied theology under the direction of Channing, and became pastor of the Second Unitarian Church of Boston. A difference of religious views between Emerson and his congregation brought about a friendly separation, and the remainder of his life was spent as a lecturer and writer. In 1833 he made a first visit to Europe, of which he has given an account in his *English Traits*. The next year he moved to Concord, and lived first in the house afterward occupied by Hawthorne and celebrated in one of his stories as the Old Manse. It was also in the year (1834) that he began to correspond with Carlyle, whom he had sought out and talked with when in England. This correspondence, lasting from 1834 to 1872, has been published, and shows the two men with all their differences, yet with many deep sympathies. In 1836 appeared *Nature*, a poetical rhapsody in prose, and though much admired by a small circle of readers, it took twelve years to sell 500 copies. But his oration on *The American Scholar*, delivered at Harvard, attracted the widest attention, as did also his oration delivered at Harvard Divinity School in 1838. Of these writings Oliver Wendell Holmes remarks: "Whosoever has read carefully and lovingly these three essays, *Nature*, *The American Scholar* and the *Divinity School Address*, can almost say of Emerson what he makes the sphinx say of herself:


RALPH W. EMERSON

Who telleth me of my meanings
Is master of all I am.

Representative Men, *The Conduct of Life* and *Society and Solitude* are others of his best known books. Emerson died at Concord, Mass., April 27, 1882. Matthew Arnold declared that if Emerson had only had the power of sustaining himself at the sublime heights he sometimes reached, he would have ranked among the world's great poets. He is the friend of all who would live in the spirit. See *Ralph Waldo Emerson*, by Holmes, in the series of the American Men of Letters.

Em′ery, a mineral belonging to the same class as ruby, sapphire and other precious stones. In outward appearance emery has nothing in common with the precious stones to which it is related. It is a dense, opaque, dull, bluish-black substance, like a fine-grained iron-ore. It is found in large, bowlder-like masses on Naxos and some of the other islands of the Grecian archipelago. It is made ready for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness. Emery-powder, as it is next in hardness to diamond-dust and crystalline corundum, is used for cutting and polishing many kinds of stone. Glass stoppers of all kinds are ground into their fittings with it. Plate-glass is ground flat by its means. When used for polishing metals, it has to be spread on some kind of surface to form a fine file. Emery-paper, emery-cloth, emery-sticks, emery-cake and emery-stone are used for this purpose. Emery-wheels are largely used for polishing iron-castings. They are a mixture of emery-powder and hard, vulcanized india-rubber.

Emigra′tion means going out of one country into another, and generally to a far-away part of the world. In the country which people leave they are generally called emigrants or wanderers out; in that in which they settle they are usually styled immigrants. Jacob and his family were immigrants into Egypt, and their descendants became emigrants from that country when they went to inherit the promised land. Among the main causes which have led to emigration at different times are the pursuit of wealth, the pressure of over-population at home and discontent, political, social or religious. The Spaniards came to America to get gold. Many of the Greeks in old times emigrated because of over-population. Political and social discontent accounts in great measure for the large numbers of Irish emigrants. Forced service in the army is one great cause of German emigration. Religious persecution led to the emigration of the Huguenots from France to England and of the Puritans from England to North America. At the end of the 15th century the opening of the passage to India round the Cape of Good Hope by Vasco da Gama and the discovery of America by Columbus at once brought to the eyes of Europeans new lands, and then modern emigration began. The Spaniards left their motherland to go to the West Indies and to Central and South America; the Portuguese to Brazil, the East Indies, India and Ceylon; the Dutch to the East and West Indies, Guiana, New York and the Cape of Good Hope; the French to Mauritius and Bourbon, the West Indies, Louisiana, India and Canada; the English to the West Indies, North America and, later, to India, Australia and

South Africa. European emigration has been greatest since the 19th century, because the population has increased so enormously. Europeans are naturally attracted to countries of like climate, which have not already an over-large population and in which the chances of gaining wealth are good. For these reasons the greatest emigration has been to the United States, Australia, South Africa and the temperate parts of South America, for example, the Argentine Republic.

Emin Pasha or **Bey,** proper name **Eduard Schnitzer,** was born at Oppeln, Silesia, in 1840. He studied medicine, and in 1864 went to Turkey, where he became a well-known physician. He learned to speak Turkish and Arabic easily, and adopted Turkish habits and customs. He also adopted the name Emin, which means the faithful one. In 1876 he joined the Egyptian service, and proceeded as chief physician to the equatorial province, of which he was made governor in 1878 by "Chinese" Gordon. Here the sudden rising of the Mahdi shut him up and out of the world. The expedition sent under Stanley for his rescue reached him in May, 1888. In 1890 he entered the German service and at once made his way again to Central Africa. He was, however, killed in 1892 by Arabs near Nyangwe. See Stanley's *In Darkest Africa.*

Em'met, Robert, an ill-fated Irish patriot, was born at Dublin in 1778. At fifteen he entered Trinity College, where Moore, the poet, was his fellow-student, but soon left to join the United Irishmen. He next traveled in Europe, talked with Napoleon and Talleyrand in 1802 on behalf of the Irish cause, and came back the next year to expend $15,000 of his own fortune for muskets and pikes. With a small band he designed a plot to seize Dublin Castle and make a prisoner of the viceroy. The rising utterly failed, and Emmet, who had clothed himself for the occasion in a green coat, white breeches and cocked hat, saw nothing result from the enterprise but a few ruffianly murders. He escaped, but coming back for a last leave-taking from his sweetheart, Sarah Curran, the daughter of the great Irish orator, he was arrested, put on trial Sept. 20, 1803, condemned to death, and hanged on the following day. Just before receiving sentence he made a speech which still thrills the reader by its noble and pathetic eloquence. See Madden's *Lives of the United Irishmen.*

Empo'ria, county-seat of Lyon County, Kan., 60 miles southwest of Topeka. It is a trade-center for a large farming and stock-raising section, and has implement factories, corrugated metal and marble-works, flour and grist-mills. Emporia has 20 churches, 3 libraries, a training school and a business college. A State Normal School, the College of Emporia, the Emporia School of Music and Art, and the Cravens School of Music are located there. It is a division point on the A. T. & S. F. railroad, is on an M. K. & T. branch line, and has the second largest stock-yards on the Santa Fe system. It was founded in 1856 and incorporated in 1870. Population, 9,058.

Ems or **Bad-Ems,** a bathing resort known to the Romans and famous in Germany as early as the 14th century. It is on the River Lahn, ten miles from Coblenz. Its warm mineral springs contain soda. The temperature of the different springs varies from 80° to 135° F. Population, about 7,500.

Emu, a running bird of Australia, closely related to the cassowary. The emu lives on the plains, the cassowary only in the forest and dense scrub. The emus have no cap or helmet like the cassowaries. The head and neck are not bare as in the cassowaries, but are provided with feathers. The plumage is heavy and dull-brown in color. The wing-rudiments are very small. The bird stands about five feet high. Its food is exclusively vegetable, consisting of fruits, roots and herbage. It may be tamed, and breeds easily in captivity. It lays six or seven dark-green eggs, nearly as large as ostrich-eggs, in a cavity scooped in the earth, usually in sandy soil.

EMU

Ency'clopæ'dia, meaning general instruction, is a work professing to give information in regard to the whole circle of human knowledge or in regard to everything in some division of it. The older encyclopædias attempted to give everything then known on all subjects; but, as knowledge has increased, it has become more and more necessary, in order to say something about everything, to be content not to say everything about anything. The great Latin collections of Terentius Varro, dating from 30 B. C., and the *Natural History* of Pliny the Elder are the first works which can in any sense be called encyclopædias. In the 10th century the Arabian, Farabi, wrote an encyclopædia remarkable for the time. Vincent of Beauvais, under the patronage of Louis IX of France, gathered together the whole knowledge of the middle ages. The first modern English work of the kind was the anonymous *Universal, Historical, Geographical, Chronological and Classical Dictionary,* which appeared in 1803. The *Cyclopædia* of Ephraim Chambers, in 1728, was the first to use cross-references. It was a French translation of this work which

Diderot used in making the famous *Encyclopédie*, which became the organ of the most advanced and revolutionary thought of the time, and gave a name, the *Encyclopedists*, to a party of philosophers and politicians. The great *Encyclopædia Britannica* first appeared at Edinburgh in 1768-71, and has since gone through many editions. Other popular encyclopedias are Charles Knight's *Penny Cyclopædia* and *Chambers' New Encyclopædia*. Of American works may be mentioned *The Americana*, the *New International* and the *Universal Cyclopædia*.

En'dicott, John, colonial governor of Massachusetts, was born in 1589, at Dorchester, England, and landed as manager of the plantation of Naumkeag (Salem) in 1628. In 1630 London's Plantation became a part of the government of New England, and Endicott gave place to John Winthrop as governor. Six years later he headed a bloody but useless expedition against the Block Island and Pequot Indians. Except for five years, he was deputy-governor or governor of the Massachusetts colony from 1641 to 1665. Endicott was a zealous Puritan, high-tempered, kind and brave. He manifested some personal peculiarities: He cut out the cross from the military standard, had four Quakers put to death, forced the women to wear veils at public assemblies and was opposed to long hair. He died at Boston, March 15, 1665.

En'dosperm (in plants). A food-tissue within the embryo-sac (which see) of seed-plants and used by the embryo. It makes up the bulk of many seeds, as in pines and the cereals, and contains stored food of various kinds, prominent among which is starch. It is sometimes soft and mealy, and in other cases it is horny. In the so-called vegetable ivory it is as hard as the name suggests. An obsolete name for it is albumen. In the alternation of generations (which see) it is a gametophyte, and being associated with the egg it evidently is a female gametophyte. See SEED.

Endym'ion, in Greek myth, a youth famous for his beauty and never-ending sleep. As he slept on Mt. Latmos in Caria, his beauty warmed the cold heart of Selene (the moon) who came down to kiss him and to lie by his side. It was said that Selene had sent him to sleep that she might kiss him without his knowing. On this story Keats wrote his well-known poem *Endymion*.

Enfield Rifle. See RIFLE.

Engine. See STEAM-ENGINE.

Engineering, the work of constructing, designing or operating machines or other structures or equipment having for their aim the economic and scientific utilization of the various forces and resources of nature for the purposes of man. Originally engineering could be classified under the two main headings of civil and military engineering, but modern developments have been so great as to bring into prominence many different forms, such as mechanical, mining, electrical, chemical and sanitary engineering, leaving the term civil engineering to such phases, exclusive of strictly military and marine work, as are not included under these special headings. The old distinction between the civil and military engineer is rapidly disappearing.

The work of engineers is in connection with such things as canals, harbors, bridges, railways, mining and metallurgical plants, factories, sewage-systems, city water-works, lighting and power-plants, machines of various kinds, submarine boats etc. In fact the services of the engineer are required in nearly all modern industrial, municipal and military operations which are to be economically, methodically and scientifically carried out on an extensive scale. All of the discoveries and laws of science and mathematics are here practically applied and utilized for the improvement of man's material wellbeing so far as the ingenuity of the engineer will permit. Thus the utilization by modern engineers of steam-power discovered by Watt now enables one man to do as much work as formerly required thirteen or fourteen hundred men.

The military engineer in the field has to see to such things as the overcoming of obstructions to the marching or transportation of troops, military surveys, construction of maps, selection of camping-grounds, communication, field-fortifications, methods of siege etc. The term ordnance-engineer is often given to those officers whose work consists in designing or constructing cannon or firearms. Engineers of all kinds are now employed in connection with military and naval works, but they are not usually called military engineers unless given a military commission.

The preliminary training for engineers is given in the various technical schools, but one can scarcely hope to be entrusted with important engineering works until he has had several years of practical experience. For the degree of C. E. or M.E. most engineering schools of repute require four years of undergraduate work, about three years of successful experience and one year of graduate work. The four-year courses for the most part aim to give a thorough grounding in mathematics and physics, with special reference to the various forms and applications of power, the strength and qualities of the ordinary materials used in construction, freehand and mechanical drawing and the use of the common engineering instruments. A considerable amount of time is also expected to be spent in practical shopwork.

As the work of the engineer requires a considerable amount of maturity and ability to secure a firm, accurate grasp of fundamental relations, it is best that one should have a good general education before entering upon an engineering course. In the meantime much help can be gained from the different magazines dealing with engineering and scientific subjects, as the *Scientific American* and the accounts of the proceedings of the engineering societies of which there are many in the United States, national, international and local.

The opportunities at the present time for the skillful and reliable engineer are excellent, particularly if one has ability as an administrator. It will become more and more desirable in future for the railroad-president, the factory-superintendent, and the mine-manager, to have a knowledge of the technical side of his work, and such positions will more and more demand technically trained men. In the field of construction, while comparatively speaking the great bulk of railroad-track has already been laid, much work yet remains to be done in the building of branch-lines, cutting down grades, improving track-beds and in the solution of the growing problems of city-transportation, sanitation and farm-irrigation. In the fields of chemical and electrical engineering, the possibilities are simply unlimited. A single new discovery or invention might lead to a complete revolution of our industrial life. For instance: the discovery of a cheap means of separating aluminium from clay might lead to a discarding of the use of iron for a great many purposes; or the perfection of an electric storage-battery might do away with the use of steam-power almost entirely. Even the problem of aerial navigation has already engaged the attention of the modern engineer.

The prospective engineer can make no mistake in taking time and patience to learn in detail the practical workings of his own particular line from the ground up. As to financial returns, the engineer is more fortunate than the doctor or the lawyer in that he is usually able to command a fair salary for his work from the outset, while the ultimate returns of his mature labor may be very large. The qualities most essential to the success of the engineer are energy, practical judgment and a painstaking, accurate temperament.

England, the broad southern section of the island of Great Britain, excepting the small western peninsula of Wales. England is bounded on the north by Solway Firth and Scotland, from which the famous Cheviot Hills and the Tweed River partly separate it; on the east by the North Sea; on the south by the Strait of Dover and the English Channel; and on the west by the Atlantic Ocean, Wales and the Irish Sea. The name is a derivation of *Anglen,* southeast of Sleswick in Denmark, the home of the Angles who, with their kindred, the Saxons and Jutes, conquered the native Britons and gave their name to the country. England is roughly triangular in shape, with shores so deeply indented that its coast-line is longer in proportion to the size of the land than that of any other country except Scotland and Greece. England covers an area of 50,874 square miles.

England is a level country except for the northwest and west. The picturesque Lake District, famed through English poetry, is in the northwest, where the highest elevation is reached at the summit of Sca Fell Pike, rising to 3,210 feet. The Cheviot Hills on the Scottish border extend through the Pennine range nearly to the center of the country, with The Peak, in Derbyshire, the highest point, an elevation of 2,088 feet. There are hills near the Welsh border and in Cornwall and Devon, with the flattest, lowest land surrounding. The remaining country is beautiful rolling lands and river valleys, with the rounded hills and great trees typical of English rural scenery. In *The Downs,* near the Channel, are valuable chalk deposits. There is a network of navigable rivers in England, the chief being the Trent, the Thames, the Humber, the Tyne, and the Severn.

The climate is mild, equable, tempered by the Gulf Stream, with much rainfall and fog. The fog of London is internationally famous. Agriculture, dairying, the raising of sheep and hogs, and fishing, are the chief occupations. England comprises in her fisheries about seventy per cent of the entire catch of the British Isles. The chief fisheries are along the North Sea Coast. The chief mineral wealth consists of coal, iron, tin, and chalk. The manufactures of England are exceeded in value and variety only by the United States. The great cotton mills, the manufacture of woolen goods, hosiery and lace, carpets, metal goods, machinery, hardware, and pottery furnish the chief products.

Although the name England is often applied to the entire island of Great Britain, and usually to England and Wales, it is wrongly used except for the actual geographical division of England. The name Britain was known to the ancients, and the name England given by the Angles only to that portion of the country in which they settled, which did not include either Wales or Scotland. The population of England, in 1931, was 37,789,738.

See ANGLO-SAXON; CHANNEL, ENGLISH; FOG; GREAT BRITAIN.

Englewood, a city in Bergen County, New Jersey, is situated fourteen miles from Jersey City. It is thirty-five minutes' ride distant from New York City. Englewood has excellent schools, efficient fire equipment, and a large public library. The city park and boulevard system is well-planned. The population, according to the census of 1930, is 17,805.

English Channel. See Channel, English.

English Language, The, now spoken by 130 millions of people as their native tongue, especially in the British Isles, North America, South Africa and Australasia, was in the fifth century, A. D. the speech of but a few thousand Teutons who landed in England from their homes about the mouths of the Rhine, the Weser and the Elbe. At that day the English language probably had some 2,000 words; at present its vocabulary is variously estimated at from 38,000 to more than 100,000 words. The English-speaking Angles, Saxons and Jutes became the conquerors of the Britons from whose language they adopted a few Celtic terms. Most of these words had reference to domestic occupations, as for example *clout*, *cradle*, *darn*, *mop* and *pillow*. English belongs not to the Celtic but to the Teutonic group of the Indo-European family of languages. Owing to the fact that it was originally spoken by the dwellers on the low-lying coastal plains which border upon the North Sea, it is often described as the "Lowest" variety of the Low-German speeches. Even at the present time English is closely akin to the Dutch, the Flemish and, especially, the Frisian dialect.

Before the end of the 6th century the position of the English in Britain had been secured. The Angles gave their name to the language. There however were several dialects in the old English speech; and these dialects endured for several hundreds of years. Old English or Anglo-Saxon was a highly inflected tongue. Nouns and adjectives had several declensions, nouns had five cases, and verbs were distinguished by far more inflexions than is at present the case. The poems of Cædmon and Cynewulf and the prose of King Alfred illustrate the English of this period. Alliteration was the device employed in poetry in the place of rime. The Anglo-Saxon forms of poetry and prose survived the Norman Conquest, but the opening of the 12th century saw the rise of an important stream of Norman-French influence. The two principal books written in English between 1100 and 1250 are the *Ormulum* of Orm and the *Brut* of Layamon; and these books, although their forms are still Anglo-Saxon, already contain many French words.

In the Middle-English period, between 1250 and 1500, the old English inflexions gradually but finally disappeared. This was a natural result of the Norman and French intolerance of strange inflexions, but the disappearance of inflexions had begun even before the Conquest. Foreigners were willing to learn English words, Englishmen were forced to learn foreign words; but neither Englishmen nor foreigners found it necessary to retain the endings of the early English grammar. French was the fashionable and literary language during most of this period; but the use of it declined from the middle of the 14th century. In 1362 an act of Parliament permitted the use of the English language instead of Norman-French in the law-courts. In the latter part of this period the English language in the hands of Geoffrey Chaucer (1340-1400) touched a literary height hitherto unknown.

During the Tudor period and, above all, during the reign of Queen Elizabeth the English language became, as it were, standardized in poetry and prose. Shakespeare and Marlowe in the drama, Spenser and Milton in the epic and Hooker, Bacon and the compilers of the English Bible and Prayer-Book in prose founded a body of classic literature that gave to English a unity of form which had been sadly wanting in the Middle-English period. Meantime many foreign words crept into the English tongue. The revival of learning was responsible for a vast influx of terms borrowed or coined from the Latin and Greek, but principally the Latin.

Modern English has changed comparatively slowly, except by the adoption of new terms to express new ideas or to denominate novel inventions and things. Many of the new terms in Modern English are of a technical or scientific nature. Tennyson and others have attempted to revive good English words that had been for some reason forgotten. It is unfortunate, perhaps, that the English language no longer lends itself to the formation of compound terms after the fashion of German and the oldest English tradition. [It virtually forms compounds still, though the *form* is not always that of a compound.]

To conclude, English is a composite language. It includes a few Celtic terms and many Latin terms; but the body of the language, including most of its common and familiar works, is of Teutonic origin. Of the Latin terms, a few were introduced during the Roman occupation of Britain, many more through the French and many philosophic and scientific words through the Renaissance movement. Modern scientific terms in English are largely constructed from Greek roots; foreign words have been freely added whenever needed, as in commerce.

Engraving, in the strict sense of the word, is the art of graving or cutting marks or figures upon tablets of any hard substance. Certain forms of the art—as engraving for ornamental purposes upon metal, engraved writing upon tablets, gem-engraving in making signets, cameo-engraving etc.— are very old. But in a more special sense the word engraving is understood to mean the cutting of designs upon metal-plates or blocks of wood for the purpose of printing impressions from them in ink upon paper. Engravings of this sort are divided into engravings upon metal, in which the lines to be printed are sunk in, and engravings on wood, in which the lines to be printed stand out in relief, the wood between them being cut away. In metal-engravings the plate, having been inked and wiped on the surface, keeps the ink only in the hollowed lines, from which it is conveyed to the paper by the pressure of the printing-press. In wood-engraving only the raised part of the block is inked, by means of a roller, and it prints as a raised type.

The metal most commonly used for engraving has been copper; but during the 19th century steel was largely used on account of its hardness, which enables it to stand the wear of printing and to throw off a far larger number of impressions than could possibly be got from a copper-plate. Steel, however, is less readily engraved than copper, and the finished engraving is thus apt to be not so good. By a late invention the surfaces of copper-plates are protected by a very thin coating of steel, placed upon them by an electric battery, which enables them to give a larger number of good impressions without being worn. Zinc-plates have also been used for etchings. In line-engraving the main tool used is the burin or graver, a small bar of steel, pointed at one end and with the other fixed in a rounded wooden handle. This burin is held between the engraver's thumb and forefinger and pushed forward by the pressure of the palm on the handle, and cuts upon the plate of polished metal a line, broader or deeper according to the pressure and the angle at which the burin is held. In etching the plate is coated with a thin, transparent surface or ground that acid will not eat. The plate is then smoked black, so that the lines drawn by the etcher will show the shining metal underneath. The design is drawn with an etching-needle — a sharp steel point in a handle. The needle merely takes away the ground, showing lines of the bare metal ready to be acted on by the acid. The back of the plate is coated to protect it, and the plate is put in a nitric-acid bath. The acid attacks and corrodes or eats the metal along the lines drawn. When the lines which are to be the lightest and palest in the etching are bitten, the plate is taken out, and these lines covered with a varnish which keeps the acid from eating them any deeper. Then the plate is put back for the acid to eat the other lines out more deeply, till the etching is finished. What is called soft-ground etching is simply another method (of which there are many) of drawing the design. In mezzotint engraving the plate is roughened — raising a "bur" of small metal points — so that if the plate were then inked and printed it would yield a uniform black impression. The mezzotinter draws his design and then scrapes away all but the lines he wishes to appear black in the printed engraving. Engraving in recent times has suffered much because of the work done by photographic processes. The beauty of what are known as photogravures or heliogravures, reproducing paintings, drawings and photographs, makes it likely that this process will altogether take the place of engraving. See WOOD-ENGRAVING, LITHOGRAPHY, PHOTOGRAVURE; also *Etcher's Handbook* by P. G. Hamerton; Ottley's *Early History of Engraving;* and Bryan's *Dictionary of Painters and Engravers.*

Enid, county-seat of Garfield County, Oklahoma, 50 miles from El Reno. It is located in a good agricultural region, in which the leading crop is wheat. Its industries include railroad-shops, flour-mills, a brick-works, yeast, broom and ice-factories. It has good schools, a fine courthouse and substantial business-blocks. The city was established in 1893, at the opening of the Cherokee strip, and has grown steadily. It has the service of three railroads and a population of 18,000

En'silage or silage, the general name given to green crops, especially corn, packed in enclosures constructed for that purpose called silos, to be fed to stock The practice of thus preserving green crops for fodder originated about 1800, and in the United States about 1875.

Silos are quite simple in construction They may be built of wood, and so are comparatively inexpensive. The essential points to be observed in their construction are (1) to have the walls as smooth as possible inside, (2) to have few corners, preferably having it round or square and (3) to have them as nearly air-tight as possible. If built of wood, the walls may be coated with coal-tar.

In filling the silo with corn, the entire plant is taken at maturity, just before the leaves begin to lose their moisture. It is cut into pieces one or two inches long and then closely packed in. If the silo is air-tight and the corn is evenly and tightly packed, there is little danger of its spoiling. If the crop is unusually dry, a considerable amount of water should be poured upon it while it is being packed. The layer at the top may be kept from spoiling by covering it with eight inches of chaff or cut-straw until ready for use.

It is calculated that food equivalent to four tons of hay can ordinarily be produced from one acre of corn. This makes corn preserved in a silo a profitable crop, especially as it can be so compactly and economically stored. Though corn is the most satisfactory crop for ensilage, red clover, oats, rye, alfalfa, millets and cow-peas are also used. About one cubic foot of silage (30 or 40 pounds), along with other foods, is considered the right quantity per day for one cow. Though silage has been successfully fed to horses, sheep and beef-cattle, it is especially suitable for milch-cows, and a silo is consequently an important adjunct of a modern economical dairy-farm. Care should be taken to give relatively small amounts of silage to dairy-cattle until they become accustomed to it. In composition silage is not materially different from the fresh green corn.

Entomology. See INSECTS.

En'zymes (often called soluble ferments), substances of unknown but very complex composition produced in plants and animals for digesting insoluble foods or those which cannot be used readily without such change. The changes they produce are of two sorts: (1) the commoner consists in causing the food to take into its composition an additional molecule of water; (2) without any additions it may be split up into two or more compounds. Enzyme itself does not take part in the chemical reaction, but seems to act only by its presence. Consequently a very small amount of an enzyme may digest large quantities of a food. Each enzyme is restricted in its action to a particular substance. Some of the more important enzymes, the substance on which they act and the chief products are shown in the following table:

ENZYME	SUBS. ON WHICH IT ACTS	PRODUCT
Diastase	Starch	Malt-Sugar
Ptyalin	Starch	A sugar
Cytase	Cellulose	A sugar
Invertase	Cane-Sugar	Grape-Sugar and Fruit-Sugar = "invert sugar"
Maltase	Malt-Sugar	Grape-Sugar
Inulase	Inulin	Fruit-Sugar
Emulsin	Glucosides	Glucose, etc.
Pepsin	Proteids	Peptones
Trypsin	Proteids	Amides
Lipase	Fats	Glycerin, fatty acids
Zymase	Sugars	Alcohol, carbon dioxid

Epaminondas (*ē-păm'ĭ-nŏn'dȧs*), the greatest of Theban generals and statesmen, was born toward the end of the 5th century B. C. He was descended from an old family which had become poor, and he was unknown till he was 40 years old. He is said to have saved the life of Pelopidas in battle in 385, which was the beginning of one of the most famous friendships of olden times. Thebes had been in the hands of a Spartan garrison, but when they were driven out by a desperate but successful stratagem, Epaminondas stepped forward at once into the ranks of the patriots. He was sent to Sparta in 371 to bring about a treaty of peace between the two countries. Here he displayed as much firmness and dignity as eloquence in the debate which ensued upon the question whether Thebes should sign the treaty in the name of all Bœotia. This would have been a recognition by Sparta of her claim to be supreme over all the Bœotian towns. To this the Spartans objected, and the war went on. Epaminondas was given the chief command, and, along with Pelopidas, with an army of 6,000 men defeated twice that number of the enemy at Leuctra (371). Two years later, with Pelopidas, he marched into the Peloponnesus and persuaded several of the allied tribes to fall away from Sparta. On going back to Thebes, Epaminondas was accused of having broken the laws of his country by keeping the chief power in his hands beyond the time appointed by law, but he made a strong defense and was acquitted. In the spring of 368 the war between Thebes and Sparta was renewed with greater fury than ever. Epaminondas made a second and somewhat unsuccessful invasion into the Peloponnesus. To make up for this unsuccessful undertaking, he marched with 33,000 men into Arcadia, and joined battle with the main body of the enemy near Mantinea in 362 B. C. Epaminondas charged at the head of his men and broke the Spartan phalanx, but was fatally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, he waited till he heard that his Thebans had won the victory, then drew out the javelin with his own hand, saying: "I have lived long enough." His death was the deathblow to Theban supremacy.

Ephesus (*ĕf'ē-sŭs*), one of the twelve cites of Asia Minor settled by the Ionian Greeks, was in Lydia, near the mouth of the River Cayster. It was long before Ephesus became of importance, though a sacred city from an early time. Conquered first by the Lydian and next by the Persian kings, it came, after the death of Alexander the Great, under the government of his favorite bodyguard, Lysimachus, by whom it was greatly strengthened. At last it came into the possession of the Romans. In the time of Augustus it was the greatest place of trade of all the cities of Asia west of the Taurus. This was its position when visited by St. Paul, who lived here for three years, and wrote one of his great letters to its Christian church. But the destruction of its great temple by the Goths in 262 A. D. gave it a blow from which it never recovered. In 431 the third great council of the Christian church was held here. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane, it had almost wholly perished. Among the ruins of Ephesus are fragments of a great theatre—alluded to in the account of St. Paul's preaching in the city—of a music-hall and of many walls and towers. About a mile northeast of the city was the famous temple of Diana. This wonderful building, one of the seven wonders of the world, was set on fire by an Ephesian, it is said, on the night Alexander the Great was born, thereby to give him an undying name. It was afterward rebuilt by the people in greater splendor than before, even the women giving their jewels to raise the necessary money. It was the largest Greek temple ever built, being 425 feet long and 220 wide. It had 127 columns, each sixty feet high. It was filled with statues and pictures made by the best of Grecian artists. The altar of the goddess was adorned with the work of Praxiteles. It was robbed of its treasures by Nero, burned by the Goths, and finally destroyed in the reign of the Roman Emperor Theodosius I, who issued his celebrated edict against the ceremonies of the pagan religion in 381 A. D. The site of the temple was discovered in 1869, and excavations were made until 1874, which have greatly increased our knowledge of this wonder of the world. See Falkner's *Ephesus and the Temple of Diana.*

Epictetus (*ĕp′ĭk-tē′tŭs*), a celebrated Greek philosopher, was born at Hierapolis, in Phrygia, about 50 A. D. He at first was a slave and stood his master's harsh treatment like a true Stoic. After being freed, he studied philosophy, and with other philosophers was driven into exile by the Emperor Domitian. He settled at Nikopolis in Epirus. He left no works behind him, but his pupil, Arrian, who wrote a life of Alexander the Great, gathered his sayings and maxims with a lover's care into the *Enchiridion* (Hand-book) and into eight books of commentaries, four of which are lost. These show the simple and noble earnestness of the philosopher's character, as well as his real, heartfelt love of good and hatred of evil. He is one of those who, "groping in the deeps of thought, touched God's right hand and knew it not." See Farrar's *Seekers after God.*

Epicurus (*ĕp′ĭ-kū′rŭs*), a famous Greek philosopher, was born in 342 B. C. on the island of Samos, where his father was a school-master. When eighteen he went to Athens, but soon came back to Asia. He studied philosophy, and at Mitylene, in his thirty-second year, he first opened a school of philosophy. After teaching five years, he went again to Athens in 307 B. C., and set up a school of philosophy in a garden which he bought and laid out for that purpose—whence his followers were called the "philosophers of the garden." Although Epicurus taught that pleasure is the chief good, the life that he and his friends led was one of the greatest simplicity. They were content, we are told, with a small goblet of light wine, and the rest of their drink was water. And an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. Epicurus was very successful as a teacher. Great numbers flocked to his school from all parts of Greece and Asia Minor, most of whom became fond of their master as well as of his teaching, for Epicurus seems to have been no less amiable and kind a man than a man of force and brains. He wrote a great deal. According to one account, he left 300 volumes on Natural Philosophy, Atoms and the Vacuum, Love, the Chief Good, Justice and many other subjects. These works are lost. The only writings that have come down to us are three letters, a few fragments from one of his works and a number of his sayings. The main sources of our knowledge of his teachings are Cicero, Plutarch and, above all, Lucretius, whose great poem, *De Rerum Natura* (On the Nature of Things) contains the Epicurean philosophy. According to Epicurus the great evil with which men were troubled—the load which weighed down man's happiness—was fear—fear of the gods and fear of death. He did not deny that there are gods, but taught that as "happy and undying beings" they could have nothing to do with the affairs of the world or of men. For, he said, business and cares and anger are not in accordance with happiness, but arise from weakness, fear and dependence on others. He believed that the soul was a bodily substance, made up of fine particles scattered through the whole body, and, this being so, that soul and body died together. He therefore argued that the most terrible of all evils, death, is nothing to us, "since where we are, death is not; and where death is, we are not." He held that pleasure was the chief good, and it is from misunderstanding of the meaning of this word as used by him that the term Epicurean came to mean one who gave loose rein to all his likes and appetites. For, he tells us, it is not ceaseless drinkings and revelings, nor rare and costly viands, that make up a pleasant life, "but freedom of the body from pain and the soul from care." Among the Romans the system of Epicurus was adopted by many distinguished men, such as Horace and Pliny the Younger. In modern times many prominent Frenchmen have professed to be Epicureans. Epicurus died at Athens in 270 B. C. See Zeller's *Philosophy of the Stoics, Epicureans and Skeptics.*

Epider′mis (in plants), a specially modified layer of cells which covers all parts of higher plants. In the older parts of stems and roots, which increase in diameter year after year, the epidermis disappears, being replaced by other layers, usually cork. The epidermis is primarily a protective layer, which is interposed between delicate living cells and outside exposure. Since these living cells must effect exchanges with the outer world, the epidermis is not merely a protective layer, but must be organized in such a way that it may facilitate these exchanges. Its duties, therefore, are numerous. The epidermis is able to produce a variety of structures, conspicuous among which are hairs of many kinds. Wherever the epidermis covers green tissue it also organizes very numerous stomata, commonly known as breathing pores or automatic gateways, through which various gases pass in and out in connection with the work of the green cells. See figure under STOMATA.

Epig′ynous (*ê-pĭj′ĭ-nŭs*) **Flowers,** those in which the sepals, petals and stamens seem to arise from the top of the ovary. In such cases the ovary is often said to be inferior, that is, it is to be seen below the flower, as in the common honeysuckle. The contrasting term is hypogynous. Epigynous flowers are regarded as of higher rank than those that are hypogynous, and in the highest family, the Compositæ, the flowers are all epigynous. The noun form is epigyry. See FLOWER.

Epiphytes (*ĕp′ĭ-fīts*), commonly called air-plants, since they obtain all their food supplies from the air, having no connection with the soil or with water. They occur in great numbers in the tropics, especially the American tropics, and are found perching in great numbers upon other plants, the trees sometimes being almost covered with them. Many ferns have this habit, but it has been most cultivated by orchids and bromelias. The epiphytic orchids, with their dangling roots and odd-looking but brilliant flowers, are favorite greenhouse-plants. One of the common epiphytes of the United States is the so-called long moss or Spanish moss, which hangs in gray masses among the trees of the gulf states. It is not a moss, but a flowering plant, one of the bromelias.

Epirus (*ê-pī′rŭs*), meaning mainland, is the old name of a part of Greece lying between Illyria and the Ambracian Gulf and between the Ionian Sea and the mountain chain of Pindus. It is a mountainous region, heavily wooded and growing little wheat, though noted for its cattle and horses and for its breed of Molossian shepherd-dogs. Its best known river is the Acheron; its chief towns Dodona and Ambracia. In early times, as to-day, its people were only half Greeks, the Greek colonies being confined to the coast and southern portion. Of the Molossian kings of Epirus, the most famous was Pyrrhus, who long waged successful war against the Romans. On the conquest of Macedonia by the Romans (168 B. C.) the most revengeful measures were put in force against the Epirotes, who had helped Perseus, the Macedonian king. Æmilius Paulus, the Roman general, plundered and razed to the ground seventy towns of Epirus, and sold into slavery 150,000 of the people. From that time Epirus shared the good or bad fortunes of the Roman and Byzantine empires until 1204. Then small princes ruled the country until the 15th century, when it was at last conquered by the Turks. Epirus, peopled largely since the 14tk century by the Albanians, formed latterly a part of the Turkish province of Janina. Under pressure from the great powers, Turkey ceded the strip of land east of the River Arta to Greece in 1881.

Ep′ping Forest, where kings hunted in the olden days, once covered all of Essex (England), and extended almost to London. Inclosures slowly curtailed it from 60,000 acres to 4,000 in 1871, when London undertook to preserve what was left and to recover the later inclosures. In 1882, at a cost of $2,000,000, 5,600 acres of Epping Forest were opened to the public. Easily reached from London, its nine square miles of almost unbroken woodland, which at High Beech or Queen Victoria's wood, rises 759 feet above sea-level, form one of the largest and most beautiful pleasure-grounds in Europe. See E. N. Buxton's *Epping Forest*.

Ep′som, a small town market of Surrey, England, fifteen miles southwest of London. The springs which made Epsom so fashionable a resort in the latter half of the 17th century, gave name to the Epsom salt, formerly made from them. The church, rebuilt in 1824, contains monuments by Flaxman and Chantrey. On Banstead Downs, one and a half miles south of the town, the most famous horse-races of the world are held yearly on Derby day. The grand stand was built in 1829-30 at a cost of $100,000, and seats 7,500 spectators. Population, 10,915.

E′quinox, the time when the sun is in the plane of the earth's equator. This occurs twice a year, once on March 20th, which is called the vernal equinox, and again on Sept. 22d, which is called the autumnal equinox. The name is derived from the fact that the length of the night then exactly equals the length of the day, since the parallel rays of light from the sun, on these dates, fall upon the earth perpendicular to the axis of the earth. The sun then appears to be on the equator, and hence the equinoxes are popularly spoken of as the dates on which "the sun crosses the equator."

Equisetales (*ĕk′wĭ-sê-tā′lēz*), one of the three great plant-groups which make up pteridophytes, commonly known as horse-tails or scouring rushes. In early geological times the group was of great importance, and was represented by a great display of forest-forms. At present it contains but a single genus (*Equisetum*), represented by about twenty-five species. The equisetums have a very characteristic body. The stem is slender and jointed, and the joints separate easily. It is also green and fluted, and there is so much silica in the epidermis that the plants feel rough. It is on this account that the name scouring rush is sometimes used. Foliage leaves have been abandoned, but minute scale-leaves form sheaths at each joint. The stems are sometimes simple, at other times they branch profusely, but they are always green, since they do leaf-work. At certain times a cone-like structure, the strobilus, appears at the top of the stem, which bears the sporangia containing spores. Horsetails are found in wet ground or in very dry ground. Slender branching forms are very common along the sandy embankments of railroads. See PTERIDOPHYTES.

JOHN M. COULTER.

Era of Good Feeling, a name given to the period in American political life from 1817 to 1824, during which there practically was only one party—The Democratic-Republican. The Federalist party had almost disappeared by the end of the War of 1812, so that in 1821 President Monroe was reelected by an electoral vote of 231 out of 232. Differences of opinion regarding public works and the tariff question soon afterwards brought the era of good feeling to a close. By some historians the period is restricted to the second term of Monroe's administration.

Erard (*ȧ'rär'*), **Sebastien,** a French inventor and maker of musical instruments, was born at Strassburg, April 5, 1752. Going to Paris at sixteen, he started in business as a maker of pianos, completing his first one in 1776 or 1777. This was one of the earliest pianos made in France. He was soon considered the best pianoforte maker in Europe. The French Revolution drove him to London, where he established a factory. The grand piano was his invention, with a double-action harp and many other valuable improvements in the making of both pianos and harps. His pianos still have a reputation. He died at Passy, near Paris, Aug. 5, 1831.

Eras'mus, Desiderius, a Dutch scholar and philosopher, was born at Rotterdam, according to the date on his statue, in 1467. His guardians tried to induce him to enter a monastery, in order to obtain his property, and Erasmus, to please them, agreed to attend the Augustinian College of Sion, near Delft, where for six years he led the life of a monk. This life probably made him the bitter and sarcastic enemy of the monks that he was during the remainder of his life. He studied and taught in Paris till 1498. Among his pupils was Lord Mountjoy, at whose invitation, probably, he made his first visit to England, in 1498. He spent his time there mostly at Oxford. Six years spent in Paris give us the *Adagia*, a collection of Greek and Latin proverbs, and the *Christian Soldier's Dagger*. Another visit to England was made at the accession of Henry VIII, and on this journey he planned his *Praise of Folly*, a satire on kings and monks. He was professor of divinity and also of Greek, at Cambridge, for the next few years. In 1519 appeared his most famous work, the *Colloquia*, a series of talks on everyday subjects, the sharpness and boldness of which did much to prepare the minds of the people for the work of Luther. In 1516 his edition of the New Testament in Greek, the first published Greek text, appeared. He also edited scores of Greek and Latin texts. When the Reformation came, Erasmus stood between the two parties, and the last years of his life were spent in a long dispute and struggle with the friends and foes of the new religion, neither of whom he satisfied. In spite of these troubles, he enjoyed fame and consideration beyond that of any man-of-letters before or since. He died at Basel, Switzerland, July 12, 1536. See *Essays* by Milman, *Life* by Drummond, *Letters* edited by Froude and *Life* by Emerton.

Er'ebus, Mount, an active volcano in Victoria Land in the Antarctic regions. It was discovered by Ross in 1841, and named after one of his ships. It is 12,367 feet in height, and is the nearest volcano to the South Pole.

Erfurt (*ĕr'fŏŏrt*), a city of Prussian Saxony and the ancient capital of Thuringia, is thirteen miles from Weimar. Its two citadels once were monasteries. It was a strongly fortified city until 1873, its position on the central road through Europe giving it importance. Its cathedral, one of the oldest Gothic buildings in Germany, has very fine sculptures and bronze castings, one especially, a *Coronation of the Virgin*, which dates from the 16th century. The Augustine monastery, known as the home of Martin Luther, is now called the Martinsstift (Martin's Institute), and is used as an orphan asylum. The growing of flowers and vegetables and the raising of flower seeds are two of the principal industries. There also are manufactures of woolen, silk, cotton and linen goods, lamps, machines, shoes and beer. It was made a bishopric in 741. Since 1803 it has belonged to Prussia, except during 1806–14. The congress of Erfurt, held in 1808, was attended by Napoleon, the emperor of Russia and several princes of Germany. Population, 111,461.

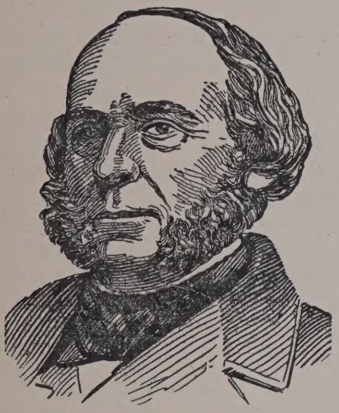
Erg, the unit of work employed in physics and chemistry. It is defined as the amount of work done by a force of one dyne when exerted through a distance of one centimeter. It requires forty-two million ergs of work to heat one gram of water one degree centigrade, that is,

$1 \text{ calorie} = 42 \times 10^6$ ergs, very approximately.

Er'got, a very astringent drug, obtained from a certain phase (the sclerotium) of a

fungus which is parasitic in the young ovaries of grasses, ordinarily of rye, and known as *Claviceps purpurea.* These sclerotia are usually elongated, dark-violet masses, which are conspicuous in the heads of rye. The fungus belongs to the *Ascomycetes*, which see.

Ericsson (*ĕr′ĭk-sŭn*), **John,** a great Swedish engineer, was born at Langbanshyttan in 1803. He entered the Swedish army, but left it after several years' service, to give his entire time to his inventions. He gained a prize in England for the best locomotive; and the principle which he introduced, of making a draught artificially so as to do away with the huge smoke-stacks which had been in use, is still employed. He invented soon after a steam fire-engine and the screw-steamer. In 1839 he came to the United States, and designed the screw-propeller for the warship *Princeton*, the first steamer that had her engines and boilers below the water line, so as to be out of the reach of shot. During the Civil War he built for the government the iron-clad vessels called monitors, from the name of the first one. These ships had a turret that turned by machinery, so that the guns could be pointed in any direction. Though laughed at by sailors, who called them a "cheese-box on a raft," they were very successful and formidable, and became famous all over the world. Among his numerous inventions are a gauge for measuring fluids when under pressure, an alarm barometer, a meter to measure the quantity of water which passes through a pipe, a pyrometer, an instrument for taking distances at sea and a sea-lead for taking soundings. He died at New York on March 8, 1889. By his own wish he was buried at his birthplace, a Swedish war-vessel coming to escort his body home, which was sent by the United States government in the man-of-war *Baltimore.* A statue is to be erected to his memory at Stockholm. See *Life* by W. C. Church.



JOHN ERICSSON

Erie, Pennsylvania, county-seat of Erie County, is situated on Lake Erie. It is the only lake-port of the state, and has the best harbor on Lake Erie, five miles in length and protected by a breakwater four miles long. It occupies the site of Fort Presque Isle, an old French fort, and is about halfway between Cleveland and Buffalo. Its lake-trade is large, consisting mainly of lumber, iron-ore, coal and petroleum. It has factories of stoves, steam-engines, car-wheels, bricks, paper, organs, pumps, brass-foundries, oil-refineries, electrical products. It is supplied with water from the lake, which is pumped to a tower 251 feet high, said to be the highest water-pipe in the world. The government-building, city-hall, St. Vincent's Hospital, Hamot Hospital, U. S. Marine Hospital, Home for the Friendless, Union Depot, opera-house and soldiers' home are among its chief buildings. Near the city is a memorial in the form of a blockhouse, in honor of Anthony Wayne, erected by the state. The city has excellent public schools, a public library, three national and several savings-banks, daily and weekly newspapers and natural gas. It was laid out in 1795, and became a city in 1851. Population, 115,000

Erie Canal. See CANAL.

Erie, Fort, was situated in Welland County, Ont., on Niagara River, almost opposite the present site of Buffalo. It was captured by General Brown at the head of a column of 6,000 Americans on July 3, 1814, the garrison consisting of 170 soldiers and volunteers, and evacuated by them on Nov. 5. It was unsuccessfully assaulted by General Drummond on Aug. 15, the accidental explosion of a powder chest nearly annihilating the storming party.

Erie (*ē̆′rĭ*), **Lake,** one of the five great lakes of North America which empty into the St. Lawrence River. Ohio, Pennsylvania and New York are on its southern shore, Canada on the northern one and Michigan on its western. It receives the waters of Lakes Superior, Michigan and Huron through the Detroit River, and discharges them through the Niagara River into Lake Ontario. It is 240 miles long and from 30 to 60 broad, its entire area being 9,600 square miles. At its southwestern end are several islands, some of which are cultivated and are noted for their vineyards. It is the shallowest of the five great lakes, and this, with the small number of good harbors, makes navigation dangerous and difficult. The chief harbors are Buffalo, Erie, Dunkirk, Cleveland, Sandusky and Toledo. It is connected with Lake Ontario by the Welland Canal, with the Hudson by the Erie Canal and with the Ohio by the Ohio and the Miami Canals. It receives no large rivers. A naval battle under Commodore Perry was fought with the British on the lake, Sept. 10, 1813. The victory is commemorated by a monument at Cleveland, O., and by a stone on the island of Gibraltar, near the spot of the engagement.

Eritrea (*ā-rē-trā′a*), an Italian colony on the Red Sea, extending from Cape Kasar to Cape Dumeirah on the Strait of Bab-el-Mandeb. It is bounded on the north and west by the Egyptian Sudan. Abyssinia bounds it on the south and west, and French Somaliland on the southeast (see ABYSSINIA). Its coast-line is 670 miles long, its area about 88,500 square miles, and its population, nearly all nomadic, estimated at 450,000. It is self-governing, and has the management of its own finances. Asmara is the seat of government; Massawah the principal town, with 2,275 inhabitants. Gold has been found near the latter town. Irrigation works are required for agriculture, but pasture is abundant.

A railway is projected from Asmara to Massawah, of which 48 miles are open. There are telegraph lines from Massawah to Perim by way of Assab and from Massawah to Addis Abeba.

Erl-king. See FAIRY.

Ermine (*ẽr'mĭn*) or **Stoat,** an animal of the same class as the weasel and mink. It has a slender body, about ten inches long, and short legs. In summer it is a reddish-brown color with yellowish-white fur underneath; but in winter it changes to a beautiful white, all except the tail, which always remains black. It is a quick, restless, brave and bloodthirsty animal, runs swiftly and climbs and swims well. It makes its home among rocks and stones, and feeds on smaller animals, such as birds, rats, mice and chickens, sucking the blood of each of its prey. It is found in Europe as far south as the Alps and in Asia and America. The ermine-fur used in trade is the white fur with the black tails inserted in regular order. It was formerly used in the linings of the robes of kings and queens and other high officials, but is not so popular now. The best furs are imported from Siberia, Lapland and the Hudson Bay territories.

Erskine (*ẽr'skĭn*), **Thomas, Lord,** a British orator and jurist, was born on Jan. 21, 1750. He was sent to sea against his will, entering the navy in 1764. On his return he studied law at Cambridge, England, and was admitted to the bar in 1775. In his first case he made a wonderful plea, which at once gave him high rank as a lawyer. He was elected to Parliament in 1783 and 1790, but his speeches in Parliament never equaled his efforts as a lawyer. He held the offices of attorney-general and chancellor to the Prince of Wales. This last position he lost by his defense of Thomas Paine. He was made Baron Erskine in 1806, and died on Nov. 17, 1823. He published several pamphlets, a romance, a few poems and *View of the Causes and Consequences of the War with France*, which ran through 48 editions. His reputation, however, rests entirely on his speeches as a lawyer, and in this respect he is unrivaled in the history of the English bar. See Campbell's *Lives of the Chancellors*.

Erzerum (*ẽrz'rōōm'*), a town and vilayet in Armenia, Asiatic Turkey, on the west branch of the Euphrates, is on a plain 6,200 feet above the sea and surrounded by mountains. The streets are crooked, narrow and dirty. The houses are built of volcanic stone cemented with mud. The city with its four suburbs has 40 mosques, a number of large bazars and a few fine buildings, with many ruins of former magnificent structures. The principal trades are tanning, dyeing morocco leather and blacksmiths' and coppersmiths' work. Its copper and iron wares are widely known. It was captured by the Russians in 1829 and 1878. It is now a Turkish city. It is the residence of English, Russian, German and French consuls. Population, 38,900. See Curzon's *Armenia*.

Esarhaddon (*ē-sär-had'on*), an Assyrian king, was the son of Sennacherib and his successor. He reigned from 680 to 668 B. C. He held his court alternately at Nineveh and at Babylon, being the only king of Assyria who ruled over Babylonia during his entire reign. His conquests extended as far as Cyprus and through a large part of Media. He was the first Assyrian king to invade Egypt, and was called king of Egypt and Ethiopia. He also conquered Judæa, carrying its king, Manasseh, captive to Babylon.

E'sau, also called Edom, the eldest son of Isaac and twin brother of Jacob, was the ancestor of the Edomites, an ancient people inhabiting Mt. Seir. He was a wild hunter, rash, passionate and generous, and no match for his crafty brother Jacob. When hungry from a long hunt, he sold Jacob his birthright as the elder son for a mess of pottage; but his anger, when he realized what he had done, was so great that Jacob fled into Mesopotamia. Esau met his brother, however, on his return from his long exile, and was reconciled to him.

Escalator, a device often called a moving staircase, is a means of carrying people from level to level by means of a system of moving trucks which are bolted to a chain connected with a driving-wheel. The trucks have the appearance of a series of steps. At top and bottom the trucks are of the same level, so that there is practically a platform which gives passengers sufficient time to step off the escalator. A curved railing, fitted with moving belts, gently shunts them off if they do not move. An example of such an escalator may be seen at the 125th St. subway station, New York City. When desired, it may be used as an ordinary staircase.

Escanaba (*ĕs'kȧ-nạ'bȧ*), county-seat of Delta County, Mich., 52 miles northwest of Marinette. It is on Little Bay de Noquette, an inlet of Green Bay, and has passenger and freight-steamer connection with all the leading ports on the Great Lakes. It is important as an iron-shipping point, having five docks for iron-ore and a large one for other products, and, besides, is in the center of a vegetable, grain and lumber-region. The city has a good public-school system, a high-school, a public library, St. Joseph's high-school and a national bank. It is served by the C. & N. W. and the M. & St. P. railways. Population, 13,194.

Escurial (*es-kū'ri-al*) or **Escorial** (*ĕs-kō'-rĭ-al*), a monastery, royal palace and burial place of the Spanish kings, situated 31 miles northwest of Madrid, on the slope of the Sierra Guadarrama, 3,700 feet above the sea. It was built by Philip II, and dedicated to St. Lawrence in memory of a victory which occurred on St. Lawrence's day. The main building is 706 feet long and 550 broad. A smaller square building, used as the royal palace, projects from the east side. It was begun in 1563 and finished in 1584. It held one of the finest collections of pictures in Europe until 1837, when a hundred of the best were taken to Madrid. The burial place of the royal family, called the Pantheon, is an eight-sided room beneath the church. The kings of Spain, from Charles V to Alfonso XII, all but Philip V and Ferdinand II, are buried here in marble tombs, placed one above another in niches in the wall. The Escorial was much injured by fire in 1872.

Esdraelon (*ĕs'drȧ'ē-lŏn*) or **Plain of Jezreel,** a valley in Palestine, extending along the River Kishon from Mt. Hermon to Mt. Carmel. It is a fertile plain, and is in the shape of a triangle, its longest side measuring 18 miles in length. Here Gideon defeated the Midianites, and in 1799 the French under Napoleon conquered the Turks. As late as 1867 the plain was annually overrun and wasted by the Arabs, but is now in a high state of cultivation. See *Haifa*, by Laurence Oliphant.

Eskimo (*ĕs'kĭ-mō*) or **Esquimaux,** a people numbering about 40,000, who are spread over the most northern parts of America, the Arctic Islands, Greenland and about 400 miles of the nearest coast of Asia. They have been found as far north as discoverers have gone, living usually within 20 miles of the seashore. They are the most thinly scattered people in the world. They seem to be allied to the American Indians, being about the same height, with slightly brown skin and coarse, black hair. They live by hunting and fishing, the seal furnishing them with food, clothes and fuel. Their houses are built of wood or stone (covered with sod) or of snow, with a funnel-shaped, half-underground passage for an entrance. The rooms are heated by lamps, and the sleeping places, somewhat like stalls, are arranged in rows along the sides, with often 50 and sometimes 200 inmates to a house. Men and women wear the same dress—a pair of trousers and a coat or sack, with a hood attached to draw up over the head, made of skins. The women use the hood as a cradle for carrying their children. The Eskimos are divided into tribes, and the tribes again into groups, while one of the oldest and most respected men is obeyed as chief of a house or wintering-place. The Eskimo of Labrador, southern Alaska and western Greenland are Christians. The name is supposed to come from an Indian word, meaning eaters of raw meat. Their name for themselves is Inuit or, in Greenland, Kaladlit. See *The Eskimo Tribes*, by Dr. H. Rink.

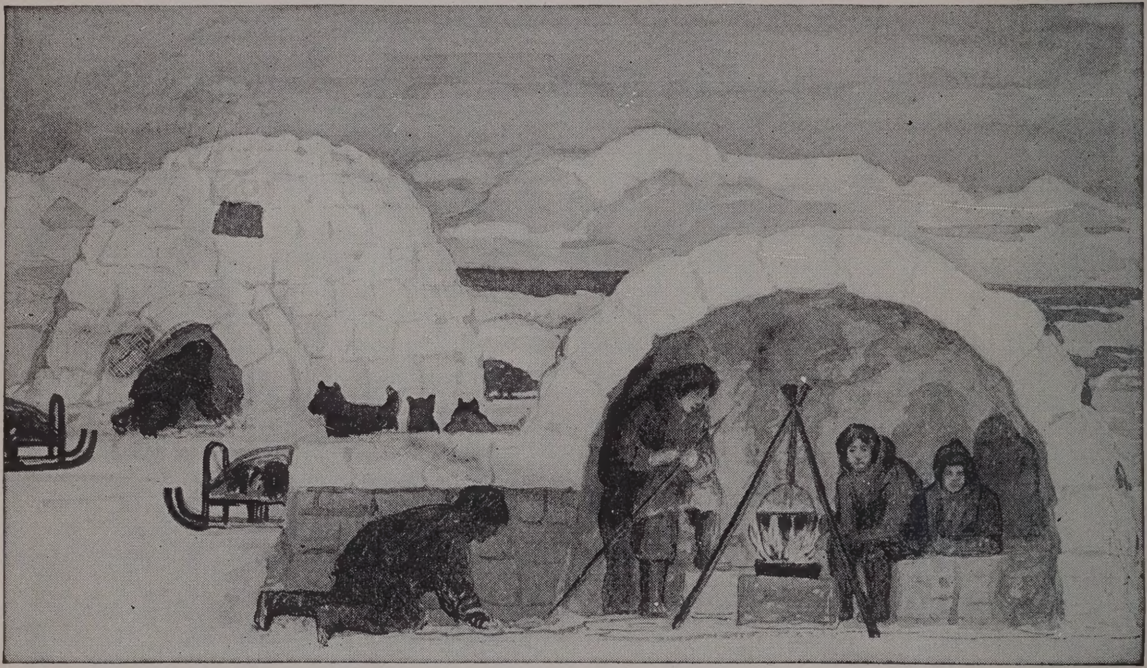
Esperanto, an artificial language invented by a Russian scholar named Zamenhof and first given to the public in 1887. It is designed to meet the requirements of a universal language. It seems necessary that any language to be universally adopted must be an artificial one, since national jealousy prevents the adoption of a living language, as English or French. A great advantage would necessarily be given to any nation whose language was thus universally adopted. On the other hand, the adoption of a dead language like Latin is out of the question, as it is too difficult for general acquisition. Esperanto is claimed to be very easy to learn for any person familiar with any one of the main European languages, as its vocabulary is made up of only such words as are common, though in varying forms, to the main languages of Europe.

Esquimault (*ĕs-kwī'ma̤lt*). The western suburb of the city of Victoria (British Columbia). Until recently it was the headquarters of the North Pacific fleet. The ships, save one or two, have been withdrawn and the Dominion has undertaken the maintenance of the fortifications, which are amongst the strongest in the empire. Esquimault has a splendid harbor. It was formerly used exclusively by the navy, but will now be opened to merchant-vessels. There is, besides, a dockyard with a huge dry-dock. Barracks and a naval arsenal complete the equipment of the place, which is heavily fortified.

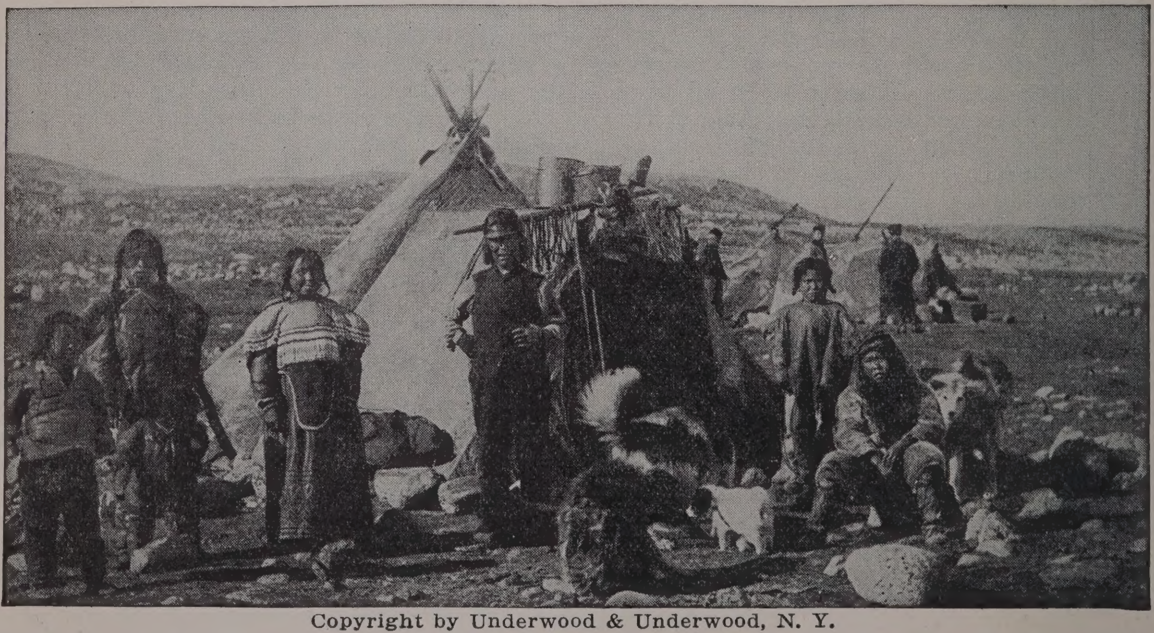
Essay (The). The essay, as a record of individual observation and personal comment on social life, was first elaborated in France by Michel de Montaigne. His book, published in 1580, has never been excelled in keen penetration, rich knowledge of life, sound judgment and frank and genial conversational comment. Lord Bacon's essays, published in 1597, are rather more like addresses or treatises in their formality; although they are brief, like letters, and pithy, like proverbs. With the rise of the periodicals, the form attained its best English expression in *The Tatler* and *The Spectator* of Steele and Addison. These brief sketches of the aspects of contemporary and local life, in their endeavor

LIFE AMONG THE ESKIMOS

IT SEEMS odd to think of Eskimos jumping the rope, but this is one of their forms of amusement. As you see, it is not the children alone that enjoy it. Below is shown the inside of an Eskimo hut. Isn't that a queer doorway? Perhaps this man is coming home to a meal. What do you think about it? In summer these huts melt and are replaced by others of earth or hides, like those in the next illustration.



In building these huts a circle is first traced, then slabs of packed snow are laid around this circle and a house built in the shape of half a globe—something like the sugar bowl hut of the children that live in the "Zoo."



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Summer camp of a very interesting tribe of Eskimos living in North Greenland.

to correct some of the minor faults of the times, added certain characteristics from ancient fable and satire, and thus anticipated the manner of much of modern political and social humor. They also embodied their experiences and observations in fictitious characters, such as Sir Roger de Coverley, thus aiding in the development of the novel and the short story. They also elaborated the criticism of history and politics, of religion and morals, of literature, art and the drama, so that these have since been regarded as separate provinces, which leave the familiar essay of to-day to apply its casual, personal and suggestive method chiefly to social manners, fashions and humors. This narrowed form has continued to flourish in England, through Goldsmith, Lamb, Thackeray and Stevenson down to the present. Literary criticism in essay form is illustrated by Coleridge, Hazlitt and Matthew Arnold in England, Sainte-Beuve in France and Lowell and Whipple in America.

In the United States, Washington Irving imported the method of humor and satire in his *Salmagundi* (1807) and the general form of the essay in his *Sketch-book* (1819). The latter contains autobiographical matter; sketches of places, things, manners and customs; studies of national and racial traits· literary criticism; tales of sentiment; and tales of mystery, like *Rip Van Winkle.* In variety of content it thus is a precursor of the magazine of to-day. Among other American essayists, Emerson deals chiefly with religion and morals, Poe and Lowell with literature. Dr. Holmes, in *The Autocrat of the Breakfast-Table*, modified the form in the direction of table-talk. Thoreau's *Walden* revived the nature essay. The tradition of Steele, Addison and Irving was continued, almost unchanged, by George William Curtis and Charles Dudley Warner.

Es'sen, a town of Prussia, 21 miles from Düsseldorf. It is situated in a rich coal and iron district, and has large manufactures of iron, tobacco, canes and vinegar, with dye works and breweries. It is known as the site of the celebrated Krupp gun-works and cannon-foundries, one of the largest establishments in the world. These works have 1,195 furnaces, 92 steam hammers, 286 boilers and 370 steam engines; they use 2,735 tons of coal and coke daily, and produce nearly 600 tons of iron a day. They employ over 20,000 workmen. The water-supply is brought by an aqueduct four miles in length. The town dates back to 873, and has an old church founded in that year. It was ruled until 1803 by the abbess of the Benedictine nunnery, who ranked as a princess of the empire. It was transferred to Prussia in 1803. Population, 294,629.

Es'sex, Robert Devereux, Earl of, was born on Nov. 10, 1567. His first service was in the Netherlands under the Earl of Leicester, his stepfather. At court he became a favorite of the queen, and was put in command of the forces sent to help Henry IV against the League in 1591. To him was largely due the capture of Cadiz (1596). He quarreled with the queen about an appointment, turning his back upon her in the presence of her ministers, and, when she resented the indignity with a box on the ear, drew his sword, swearing that he would not endure such treatment from Henry VIII himself. They were never really reconciled. After failing as lord-lieutenant of Ireland, he formed a wild scheme to get rid of Elizabeth's councilors, who were opposed to him. He entered London at the head of 300 men, expecting the people to rise in his favor, but was disappointed and forced to surrender. He was tried for treason, condemned, and beheaded on Feb. 25, 1601. Elizabeth was very unwilling to sign his death warrant, but the story of the ring given him by the queen for a safeguard and kept back by the countess of Nottingham, is now believed to be an invention. He was a writer of verse, built a monument to Spenser, and gave an estate to Bacon.

Esther (*ĕs'ter*) (a star), the Persian name of the Jewish maiden Hadassah. She was the foster-daughter of Mordecai, one of the officers of the Persian king, Ahasuerus, and was selected by the king as his wife instead of Vashti, who had refused to present herself to the king and his courtiers in the midst of a drunken revel. The king's prime minister, Haman, out of jealousy toward Mordecai, had persuaded the king to issue a decree for the destruction of the Jews. But through the influence of Esther, acting under Mordecai's direction, Haman was hanged, Mordecai was made chief in his place, and another decree issued permitting the Jews to destroy their enemies. The story is found in *Esther*.

Esthonia, a former dependency of Russia, which after the World War established a republican form of government and declared its independence. Area 7,605 s.m.; pop. 1,744,000.

Ether, a medium of exceedingly great tenuity supposed to fill all known space, including that which we speak of as filled with ordinary matter. The necessity of such a medium was first recognized by Huygens, and was admitted by all other clear thinkers as soon as Römer discovered the fact that light travels with finite speed. For, when it has been shown that light requires eight minutes to travel from the sun to the earth, the query naturally arises as to what becomes of the light (*i. e.* luminous energy) between the time it leaves the sun and the time it reaches the earth. The simplest possible explanation is that it exists somewhere in the space between the sun and the earth. But in all our experience we have never found energy except as associated with matter. For the sake of simplicity, therefore, we may assume that in this case, also, that is, in free space—space devoid of ordinary matter—luminous energy is also associated with matter. We call this matter ether. Since, however, in the 2,000 years between the time of Hipparchus and the present we are unable to detect any certain change in the length of the year, and since no retarding effect seems to be exerted upon any of the other planets, we must assume that the ether is a medium of enormously less density than the most tenuous gas of which we know anything whatever. Kelvin estimates the density of ether as 9.36x10^{-19}. Huygens, Young and Fresnel have proved, not only that light is a wave-motion, but that it consists of a transverse wave-motion. But transverse waves are possible only in a medium which possesses rigidity, *i. e.*, in a solid medium. We are driven therefore to assume further that the ether is a *solid;* or, at least, that it behaves as a solid for motions as rapid as those which constitute light. Shoemakers' wax is very brittle, as may be shown by striking it a quick blow with a hammer; but, if a hammer be laid upon a pan of shoemakers' wax and allowed to remain, it will be observed that at the end of some days the hammer has sunk to the bottom of the wax, showing that the wax behaves as a fluid with regard to slow-acting forces. The ether may behave as a fluid with respect to the comparatively slow motion of the planets through it.

In 1864 Maxwell predicted, and in 1888 Hertz proved experimentally, that electrical disturbances are propagated through space with the same speed as that of light. In other words, they proved that one and the same medium would answer for the propagation of light waves and electric waves.

Melloni and others had already proved that the laws of propagation of heat are identical with those of light. The cumulative evidence for thinking space filled with a ponderable medium of exceedingly minute density grows stronger every day. For the original suggestion of the modern ether, see Huygens' *Treatise on Light,* translated in Harper's *Scientific Memoirs.*

Ethics is the theory of conduct, so far as conduct may be judged as right and wrong. Ethics, then, means little more than morals. But the study of ethics may include that part of the theory of life which is involved in the explanation of the causes and effects of moral acts and the moral judgment.

The chief question which divides students of ethics is whether there be one unchangeable highest good, a *summum bonum,* or whether there be only *goods.* In a given set of circumstances, is there only one right or good mode of action? Or is it merely that one mode of action is more right, is better, than another? The same difficulty exists for the true and the beautiful. Are the true, the beautiful and the good fixed and absolute; or do they depend upon the use which is made of them and upon what a man carries with him to the thing that he judges? For if the good, the beautiful and the true are fixed and perfect, then ethics, like logic and the study of art, will take its place as a branch of philosophy. It will depend upon the reconstruction of experience as a whole. But if there be only goods, not good; truths, not truth; things beautiful, not beauty; then ethics may only be studied as a science. Its study will be the study of what has been judged good and bad and what is being judged good and bad; together with the natural grounds of the moral view that is taken in each case. The philosophical school of ethics tries to set up an ideal of good and thus a standard of right and wrong conduct; the scientific school seeks to content itself with facts alone.

Yet it may be possible to think of the ends or aims or goods of life as belonging to a system; so that there may be one ideal highest good, and yet within the system many goods. The system will be a growing and organic one, incomplete and unfinished, yet seeking perfection. Thus tragedy and the clash of right with right may be no more than a mode of the growth of the highest good. In this event, ethics may be both a philosophy and a science. The study of conduct as it exists is a science; the study of conduct as it tends to become is a philosophy.

But may ethics be only an art, and neither a science nor a philosophy? No; civilization affords no example of the practice of conduct without a theory. Ethics is indeed an art; but it cannot be merely an art. It must be grounded upon facts or else upon ideals. Clearly facts, or things done, and ideals, or things aimed at, both should have part and lot in ethics. Facts are nothing without values; ideals are idle and empty without facts. Therefore the student of ethics may do well to study writers of both types, scientific and philosophical. On the side of ethics as a science, he may begin with the *Data of Ethics* of Herbert Spencer; and on the side of philosophy with the *Prolegomena to Ethics* of the late T. H. Green. A lucid introductory work, like Mackenzie's *Manual of Ethics,* might precede these.

Upon the whole, the history of ethics has centered about the search for the standard of right and wrong, good and evil. Is pleasure the highest good? If so, whose pleasure? Is the highest good, as for Kant, duty? Or is it, as for Bentham and Mill, the greatest good of the greatest number? Is it to serve others, or to realize the possibilities of the self? Green held it to be the realization of the self in a common good. Others hold that the standard is present utility; the future must take care of itself. To the believer in progress, there is an ideal eternal good; but because this is only *becoming*, there also is a temporary present good. These goods may clash; but only for the moment. According to this view, principles of ethics may hold good in general, but not rigidly; they may concede something to the moment, but beware lest they concede too much.

Ethio'pia (the Cush of the Bible), the name given to the countries south of Egypt and Libya, on the upper Nile. It included modern Nubia, Sennaar, Kordofan and Abyssinia. The name Ethiopian was originally given to all the nations inhabiting the southern part of the globe, or, rather, to all people of a dark-brown or black color. The word is supposed to come from two Greek words meaning sun-burned. The part of Ethiopia of which we have the most ancient knowledge is the kingdom of Meroë, an island formed by two rivers tributary to the Nile. Its capital was Napata. The island was very fertile, with an abundance of animals and metals. It also was the site of an oracle of Jupiter Ammon. This made it a great place of resort and a trading place for India, Arabia, Egypt, Libya and Carthage, so that it grew rapidly and became, about 1000 B. C., one of the most powerful kingdoms of the ancient world. It threw off the yoke of Egypt about 760, and in turn ruled Egypt for sixty years. At one time 240,000 Egyptians settled in Meroë, and, being artisans and traders, added to its prosperity. It was conquered by Cambyses about 530 B. C. The Ethiopians sent to Darius every third year four pints of gold-dust, 200 logs of ebony, five negro slaves and 20 tusks of ivory. Augustus conquered Meroë, and we find Queen Candace (Candace means the queen) of Ethiopia mentioned among his vassals. The remains of the ancient civilization of Ethiopia are the ruins of large buildings covered with sculptures representing battles and religious ceremonies, rows of broken sphinxes, temples hewn in the rocks and several pyramids, which are higher in proportion to their base than those of Egypt. The names of 30 kings and queens have been found, the first one, named Meneliheh, being said to be the son of Solomon and the queen of Sheba. The modern history of the country belongs to Abyssinia. The area is over 400,000 square miles, with an estimated population of over 5,000,000. See ABYSSINIA and NUBIA.

Ethnology. See RACES.

Et'na or **Ætna,** a volcano on the eastern coast of Sicily, 10,850 feet high. It ends in a single cone, with a crater 1,000 feet deep and from two to three miles around. On the sides of the mountain are a large number of smaller cones, the chief being the Monti Rossi, twin peaks cast up in the eruption of 1669. The mountain rises through three zones—the cultivated region, of about 2,000 feet, where date-palms, bananas, oranges, lemons, olives, figs and almonds are grown; the wooded region in the middle, planted with forests of chestnut, cork, beech, pine, maple and oak; and the desert region beginning at about 6,300 feet from the base of the mountain, a dreary waste of black lava, ashes and sand, covered through a large part of the year with snow. The famous chestnut-tree, one of the largest and oldest trees in the world, formed by seven trees grown together and 163 feet in circumference, is in the wooded region of the slope. Nine thousand and seventy-five feet above the sea an observatory was built in 1880, which is the highest inhabited house in Europe, being 1,000 feet higher than the shelter on the Great St. Bernard. The earliest recorded eruption of Mount Etna has no date, but seems to have happened before the Trojan War. The earliest date is 475 B. C. The most remarkable eruptions are the following: In 1169, when Catania with 15,000 citizens was destroyed; 1329, when a new crater was opened; 1444, when the cone fell into the crater; 1537, which overwhelmed two villages; 1669, when a chasm 12 miles long was opened and a new crater made. In 1852–53 there was an eruption, which lasted nine months and sent out a torrent of lava six miles long, two miles wide and 12 feet deep. There have been in all about 100 eruptions, 16 of them occurring in the 19th century. The ascent is usually made from Catania. See *Etna and Its Eruptions*, by Rodwell.

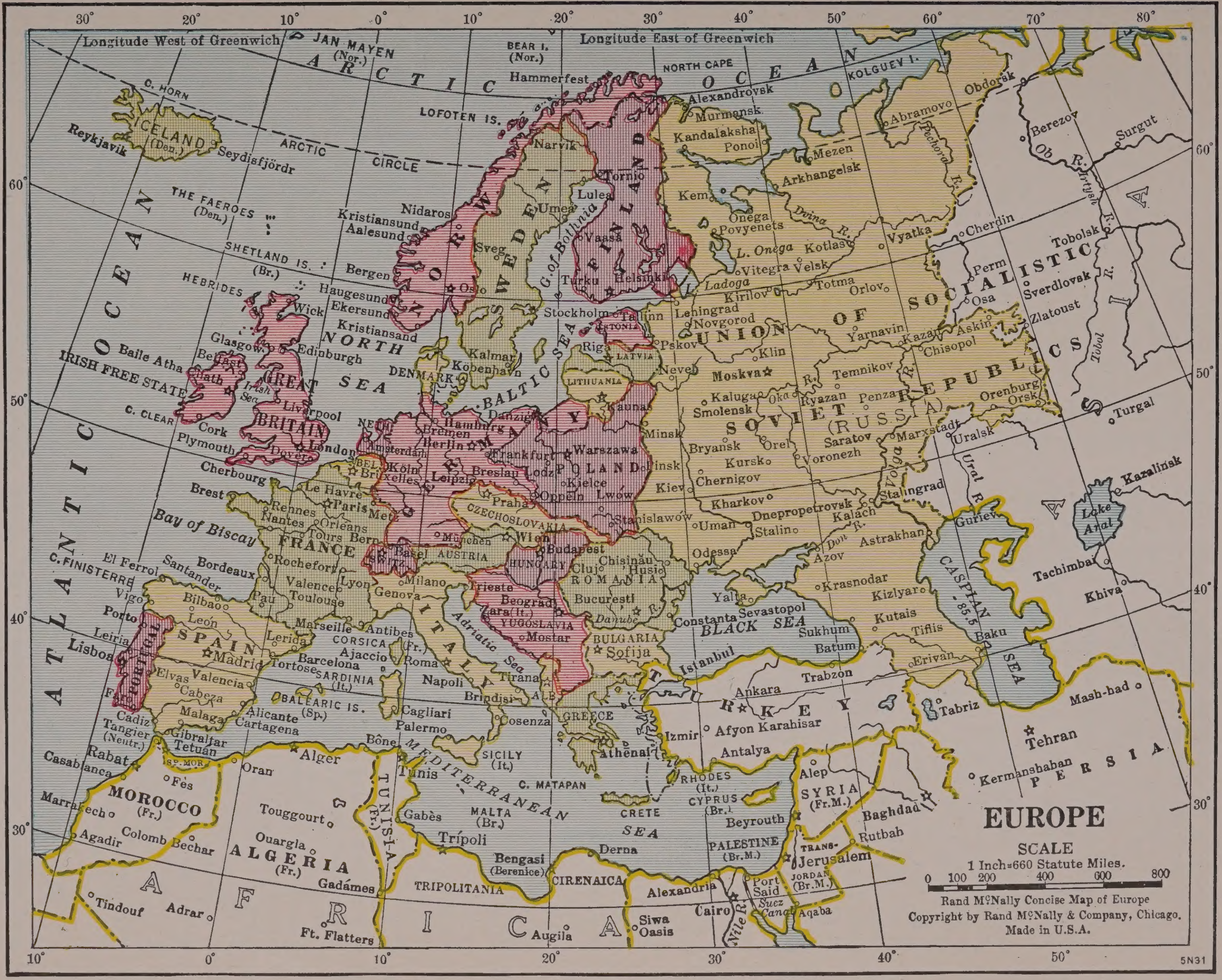
MOUNT ETNA AS SEEN FROM REGGIO IN CALABRIA

Eton College, a famous English school, situated in Eton, on the Thames, 22 miles from London. It was founded in 1440 by Henry VI. The governing body is nominated by the Universities of Oxford and Cambridge. Several scholarships at King's College, Cambridge, are filled every year by Eton scholars. The students number nearly 900. Bolingbroke, Canning, Chatham, Fielding, Fox, Hallam, Gray, Shelley, Wellington and Gladstone are on the list of its scholars. The buildings, of brick and stone, date from 1440 to 1889. The Gothic chapel is especially beautiful. The "montem," a procession of the students, which took place three times a year to Salt Hill, was one of the features of the school until 1846, when it was stopped. The boys marched to the hill, led by a captain, and spent the day, partaking of breakfast and dinner on the hill. They were visited by crowds of spectators, from whom they collected toll, called "salt," which amounted often to $5,000. See Maxwell Lyte's *History of Eton College*.

Etruria (*ė̇-trōō'rĭ-ȧ*) a division of ancient Italy, west of the Tiber and the Apennines and including the valley of the Arno. At one time it included also the valley of the Po and a region south of the Tiber. Modern Tuscany and some neighboring countries (part of Umbria) cover about the same region. Etruria proper was a union of 12 cities or cantons, each of which was independent. Veii, 11 miles from Rome and her rival for four centuries, covering 16 square miles and destroyed by Camillus in 396 B. C.; Cære, where is the tomb of the Tarquins, now the village of Cervetri; Cortona, perched upon a rock, the most ancient site in Italy; Tarquinii, 60 miles from Rome, now partly occupied by the town Corneto; Clusium; Perusia, now Perugia; and Volsinii, a once powerful city and one of the last to yield to Rome, are among the names of Etruscan cities that have come down to us. Etruria is represented as a powerful and wealthy state before Rome was founded. According to tradition, the Etruscan era commenced in 1044 B. C., nearly three centuries before that of Rome. With the beginning of history we find the Etruscans a great naval power, ruling over northern and central Italy, Rome itself being included in its dominion and governed by Etruscan kings. The great sewer, the Cloaca Maxima, the Capitoline temple and the Servian wall are remains of Etruscan rule in Rome. Many of the state ceremonies of Rome were of Etruscan origin; also the circus, the combats of the gladiators, the horse races and the triumphal processions. The arrangement of the houses, the building of aqueducts and sewers and the position of woman in the family can all be traced to the Etruscans. For a century after the overthrow of the Etruscan kings in Rome, Veii kept up a varying struggle. In 538 B. C. the Etruscans, with the Carthaginians, sent a formidable fleet to expel the Greek colonists from Corsica. They attacked the Greek colony of Cumæ in 525 B. C. and again in 474 B. C., when their naval power was shattered in a great battle, the first event of Etruscan history of which we possess a record of the time. In 476 B. C. the Etruscans were the greatest military power in Italy, but soon after that time they began rapidly to decline. The Samnites, Greeks, Gauls and Romans hastened the downfall of Etruria. In 280 B. C. the Romans reached Volaterræ, the northern stronghold of the Etruscans, and the long struggle of five centuries came to an end. The Etruscan cities kept their wealth and power as partly independent allies of Rome for a time. They gradually, however, became Roman cities, adopting Roman customs, and were finally admitted to the Roman empire in 89 B. C., while the great Etruscan families held leading positions in Rome.

The people of Etruria were called Etrusci by the Romans and Tyrrheni by the Greeks. They were a short, sturdy race, with large heads, thick arms, high color and black hair; a people so unlike the other Europeans, that Seneca said: "Asia claims the Etruscans as her own." Their origin is, however, unknown. From their monuments we learn that they had an extensive literature, composed of histories, poems and dramas; but their books have perished and our only means of learning anything of their language is from inscriptions, of which there have been about 5,000 discovered. They excelled in medicine, astronomy, mining, metal-working and the building of roads and tunnels. The bronze statues of Etruria were famous; they filled the temples of Rome, and it is said that the city of Volsinii alone had 2,000 of them. The Chimæra, in the museum at Florence, and the wolf in the capitol at Rome and a magnificent lamp at Cortona are still preserved. The painted vases found in Etruscan tombs are probably of Greek workmanship. The tombs of the Etruscans were of two kinds, the stone-pyramid, with rooms, and the chamber cut in the rock. They were furnished, as their houses were, having chairs and vases, mirrors, pottery and jewelry, and the walls were decorated with scenes from their daily life or from the underworld. See *Cities and Cemeteries of Etruria*, by Dennis.

Eubœa (*ū̇-bē'ȧ*) is a long and narrow island on the eastern coast of Greece, separated from the mainland by a narrow channel. The island is fertile; indeed in the Greek its name signifies *rich in cattle*. Cattle, wool, hides, cheese, oil, milk and honey are the chief products. The island



EUROPE

SCALE

1 Inch=660 Statute Miles.

0 100 200 400 600 800

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has passed during historic times under the control of the Athenians, Macedonians, Romans, Turks and modern Greeks. In ancient times, when not dominated by Athens or Macedon, Eubœa was shared among seven city-states, of which the chief were Eretria and Chalcis. It now has a population of over 100,000.

Eucalyp'tus. A genus of the myrtle family, containing about 140 species, which are known in general as gum-trees. The species are all natives of the Australasian region, excepting a few which belong to the East Indies. They are mostly trees, and sometimes are of great size, commonly rising from over 100 feet to more than 400 feet in height. The wood is very durable and much used in Australia. The name gum-tree has been given because the bark of certain species yields a resin from which tannin is obtained in commercial quantities. *E. globulus* has come under wide cultivation, being often planted in swamps and malarial regions, which it is said to assist in draining and rendering more healthful.

Euclid (*ū'klĭd*), a mathematician, the Father of Geometry, was a Greek, born at Alexandria in Egypt and living about 300 B. C. Very little of his life is known except that he taught mathematics in the reign of Ptolemy I, who died in 283 B. C. He probably was the founder of the illustrious mathematical school at Alexandria. When Ptolemy asked him if there were not an easier way of learning geometry, he made the celebrated answer: "There is no royal road to geometry." His principal work is the *Elements*, in 13 books, portions of which are used in schools as a text-book of elementary geometry. It has been translated into many languages, and is probably better known than any other mathematical work. The first printed edition was translated from Arabic in 1482. It is still in use as a text-book in Great Britain. Besides the *Elements*, Euclid wrote the *Data*, a collection of 100 propositions in geometry, a book much valued by Newton, and *Phænomena* or appearances of the heavens. See *Euclid and His Modern Rivals*, by C. L. Dodgson.

Eugène (*ū-jēn'*), **François, Prince,** called Prince Eugène of Savoy, was one of the greatest generals of his time. He was born at Paris, Oct. 18, 1663. Louis XIV refused him a commission in the army, and he entered the service of the emperor of Austria. He rose rapidly in rank, becoming field-marshal in 1693. He defeated the Turks in the battle of Zenta, Sept. 11, 1697, which ended their power in Hungary. The War of the Spanish Succession, in 1701, found him in command of the Italian army, but his force was too small to achieve very much. As commander of the imperial army of Germany, he helped Marlborough to gain the victory of Blenheim (1704), and later he shared in the glory of the fields of Oudenarde (1708) and Malplaquet (1709). In the war against the Turks, in 1716, Eugène, with 64,000 men, defeated an army of 150,000, and in 1717 carried Belgrade by assault, receiving in the bloody struggle his 13th wound. In times of peace he was prominent in the councils of the nation at Vienna, where he died on April 21, 1736. He was worshiped by his soldiers and has since been regarded as a hero in popular song. He served under three emperors, and used to say that in Leopold I he had a father, in Joseph I a brother and in Charles VI a master. See *Prince Eugène of Savoy*, by Malleson.

Eugènie (*ẽ'zhȧ-nẽ'*), **Marie de Montijo,** ex-empress of France, was born at Granada, Spain, May 5, 1826, of Spanish and Scotch descent. Her beauty won Napoleon III, emperor of France, to whom she was married in 1853. A wedding present, in value about $12,000, from Paris, she used in endowing a college for women, and also gave to charities $20,000 out of her husband's gift. She made a voyage to Venice, Constantinople and Egypt, and was present at the opening of the Suez Canal. She was made regent when Napoleon was at the head of the army in 1870. When the news of his surrender at Sedan reached her, she fled after midnight with a few attendants, to England, where she was afterward joined by her son and husband. Her only son, Napoléon Eugène, was born on March 16, 1856, and was killed in the Zulu War in 1879. She died July 11, 1920.

Euphrates (*ū̇-frā'tēz*), the largest river of western Asia, rises in the heart of Armenia and flows south, breaking through the Taurus Mountains in a succession of rapids and cataracts for about 40 miles. At Kurna the Tigris joins it, and with the new name of Shatt-el-Arab it empties itself by several arms into the Persian Gulf, 1,700 miles from its source. It is navigable for small boats nearly 1,200 miles, and warships can ascend it for 120 miles. In ancient times, by a system of canals and embankments, the river was used for irrigating the country as the Nile is in Egypt; but the works are not kept up. The Euphrates is mentioned in the Bible as one of the four rivers of the Garden of Eden. It is called the "great river." The city of Babylon was situated on its banks, and Nebuchadrezzar had locks and dikes made to enable large vessels to ascend it as far as the city. See *The Euphrates Expedition*, by W. F. Ainsworth.

Eureka, Cal., county-seat of Humboldt County, 225 miles northwest of San Francisco. It is located in the famous redwood region, and its lumber interests are important. Near the city is Sequoia Park, a 40-acre tract of redwood forest. The city has good schools, newspapers, gas and electric light. It is served by three railroads. Eureka has an excellent harbor on Eel River and Humboldt Bay, which the United States government has improved. The population, according to the census of 1930, was 15,752.

Euripides (*ū-rĭp'ĭ-dēs*), a famous Greek poet and the latest of the three great Greek tragedians, was born at Salamis in 480 B. C. He was the son of Mnesarchides and Clito, of humble station, but he received a good education. He was a pupil of Anaxagoras. He wrote his first play when he was but eighteen years of age, and first produced a play at the age of twenty-five, when *The Daughters of Peleus* was given, and received third prize. Not for fourteen years did he receive the first prize, which, however, was awarded him five times in all. He was studious, speculative, sensitive and morbid, living in his library. He took no part in politics. He was, however, much admired and loved, counting among his friends the great Socrates. Tradition says that he left ninety-two plays in all, but we only possess eighteen in complete form. He represented the new social, moral and political movements which were in vogue during his time. He took his characters from old mythology, but treated them realistically, and introduced scenes from everyday life. He shifted the conflict in drama from the old tradition of struggle between man and divine laws, to a new idea of struggle within man's soul, between his impulses for good and his tendencies to evil. He is the precursor of the modern romantic school. His theatrical point of view is that of the practical playwright, and he has high technical skill. His writings were highly influential on Roman literature, and later on German, French, and English. Euripides handled the old myths of Thebes, Argos, Heracles, and his native Attica, but also hunted out new material and presented for the first time such stories as those of Bellerophon, Cresphontes, and Phæton.

Euripides left Athens in the latter part of his life, going to Magnesia, and then to the court of Archelaus at Pella in Macedonia. He died in the spring of 406 B. C. at Arethusa and was buried near the city. When news of his death reached Athens, the whole city was plunged into mourning. The Athenians asked for his body for burial, and upon being refused erected a magnificent tomb on the road to Piraeus, with the inscription, "All Greece is the monument of Euripides. Macedonian earth covers but his bones." Archelaus also built a monument, inscribed "Never, O Euripides, will thy memory be forgotten." His popularity increased after his death. Among his more famous works are *Alcestis; Medea; Hecuba; Andromache; Ion; Orestes; Ophigenia; Electra;* and *The Bacchae.*

Europe (*ū'rŭp*), the smallest of the continents excepting Australia, is a great peninsula running out from Asia, in a westerly direction. Its name is probably derived from *Ereb,* which means "land of the setting sun," in a broad translation of the literal meaning of "darkness." Other suggestions as to the derivation are that the word comes from *Europa,* who was carried off by Zeus in old mythology; from *Eurus,* the southwest wind; or that it means *Broad Land.* It is bounded on the north by the Arctic Ocean; on the west by the Atlantic Ocean; on the south by the Mediterranean Sea, the Black Sea, and Turkey and Persia; and on the east by the Caspian Sea and Asia. The outline of Europe is very irregular, but it has a length of 3,400 miles and a breadth of 2,400 miles, taking its greatest measurements. It extends over an area of approximately 3,750,000 square miles, which includes, with the islands, only seven per-cent of the land surface of the world.

In proportion to its area, Europe has a longer coastline than that of any other continent, as it is so very irregular and pierced with such frequent deep indentations. The White Sea penetrates deeply on the north. The Baltic Sea curves far inland to form the Gulf of Finland and Gulf of Bothnia, from the west, which coast is also broken by the North Sea and the English Channel. The Adriatic Sea on the south isolates most of Italy from the mainland. Other southern indentations of importance are the Ægean Sea, Sea of Marmora, Black Sea, and Sea of Azov. Along the southern coast are many islands, outcroppings of the great mountain system of the continent. The larger of these are the Balearic Islands, Corsica, Sardinia, Sicily, Crete, and Cyprus. On the west is the large island of Great Britain, and the Irish Free State. Iceland is an island to the northwest, lying just south of the Arctic circle. There are a number of islands in the Baltic Sea, and to the north the Lofoten Islands are the largest of the many that dot the Scandinavian coast line.

Surface. The triangular continent of Europe divides naturally into two great regions, the extensive plains in the northeast, and the highlands which stretch from near the center towards the southwest, with Scandinavia a mountainous peninsula, apart from either division. The great plain occupies about two-thirds of the entire continent. It separates the two mountain systems of Europe, the Scandinavian on the north and the southern Europe on the south. The great plain in the east comprises Russia, and takes its character from Asia, from which it is projected. It is broad and massive in the eastern part; and narrow, richly articulated, open everywhere to the influences of the sea in the west. The eastern plain is uniform and the western of great diversity, a topographic difference which is of immense political significance. The northern part of Europe in recent times (from a geological standpoint) was covered by a sheet of ice, which left glacial deposits and greatly modified the surface of the land, changed the course of streams and scooped out lakes.

The highest point of Europe is on the summit of Mt. Elbrus, in the Caucasus Mountains, which rises to an elevation of 18,465 feet. The lowest point is in the Caspian Sea in Russia, eighty-six feet below sea level. The highest point in the Scandinavian mountains on the north is 7,566 feet. This system extends from Finland through Sweden and Norway, Scotland and Ireland. In the south, the great mass of the Alps Mountains, covering an area of nearly 100,000 square miles, forms the center of the mountain system which stretches toward France, Germany, Hungary, and Italy. The highest summit is the magnificent peak of Mont Blanc, which rises to an elevation of 15,781 feet amid the snow-crowned peaks of many other famed mountains. Other great peaks are Mt. Rosa, 15,217 feet high; the beautiful Matterhorn, 14,780 feet high; the celebrated Jungfrau, which has an elevation of 13,671 feet. The beautiful Tyrol mountains do not rise over 13,294 feet, the height of Piz Bernina, and the greater part of the high peaks are a thousand feet or more lower than that. The Tyrol scenery, however, is among the most celebrated in the world. The Alps are a famed winter resort, with the great peaks, the clear, cold mountain lakes, the sports that have made Switzerland in particular a loved spot to many. The Pyrenees stretch between France and Spain, rising to 11,165 feet in the summit of Maladetta. To the east are the Balkans, the Carpathians, and the Caucasus Mountains. The Caucasus peaks include Mt. Elbrus, the highest point on the continent, and several peaks which rise over 17,000 and 16,000 feet. The Mediterranean shores are mountainous, high and steep, with no important river ports, and seldom a flat coast or delta. Europe owes much of its commercial supremacy to its remarkable coast line, lengthened by islands and channels, and the deep penetration of the sea into the land.

Rivers. The main European watershed runs from the southwest to the northeast. Three of the important rivers rise in the Alps. They are the Rhine, which is 700 miles in length and drains into the North Sea; the Rhone, 500 miles long, flowing into the Gulf of Lyons on the Mediterranean; and the Po, 420 miles long, which empties into the Adriatic Sea. From the Black Forest, north of the Alps, issues the Danube, famed in story and song, flowing 1,725 miles to the Black Sea. The Volga, longest river in Europe, flows 2,300 miles through Russia, draining it south into the Caspian Sea. The Dneiper, 1,400 miles long, and the Don, 1,100 miles long, also flow south through Russia and drain into the Black Sea and the Sea of Azov respectively. The Dvina, 400 miles in length, is the longest river draining Russia to the north. It empties into the White Sea. The Pechora, 1,000 miles long, rises in the Ural Mountains and Asia, flowing through northeastern Russia to the Arctic Ocean through Pechora Bay. The Elbe, Oder, and Vistula drain Germany and Poland to the north, and the Seine, 475 mile river of France, flows to the English Channel. The Ebro, 400 miles long, is the principal river of Spain, emptying into the Mediterranean. Others are the Tagus, 550 miles long, flowing to the Atlantic, and the Douro, Guadiana and Guadalquiver. The chief river of England is the Thames, 215 miles long, emptying into the North Sea, after flowing through London, as the Seine flows through immortal Paris.

Climate. The climate of Europe is generally pleasant and equable. Extremes are encountered in both north and south, especially in Russia. There are no desert areas, and rainfall is sufficient for agriculture. Norway and Sweden are famed summer resorts for travellers, and the countries of Europe around France, Spain and Italy, continually beckon. Along the Mediterranean coats, in Switzerland, in the Rhine country, and around Biarritz and Bordeaux in France, are to be found thousands of tourists annually. The blue skies of Italy are famed. The north of Russia has severe winters, as are also to be found in the Scandinavian countries and Iceland. A peculiarity of English climate is the fog, especially in London.

Plant Life. Many of the plants found in the south of Europe undoubtedly originated in Africa or the East, such as the vine, olive, orange, lemon, fig, peach, almond and apricot. This may be true even of the myrtle. Others are undoubtedly natives of Europe, as are the apple, pear, plum and cherry. The most northerly regions have strictly arctic flora. In Russia there is a region which is only productive of grass, but elsewhere are found trees and flowering plants. The spruce, fir and pine flourish in the north, and yield to the oak and beech, proceeding southward. Next comes the region of the chestnuts and vines, with some oak, and in the extreme south, the sub-tropical trees. In the zones from north to south are grown first barley and wheat; then rye and oats; next, cereals and potatoes, and in the south, all these and rice also.

Animal Life. The highly civilized condition of most of Europe has almost exterminated large wild animals in the country. The bear, reindeer, wild boar, wolf and lynx are still occasionally found in the less inhabited areas. Among the smaller animals are the fox, marten, ermine, civet, squirrel and rabbit. The elk, stag, deer and roebuck are found in the south; the ibex on the high central mountains, and the chamois in the Alps. The reindeer is common in the extreme northern part of Europe. There are valuable fisheries, particularly cod and herring in the northern waters, and the tunny and anchovy in the Mediterranean. There are many singing birds in Europe, and such larger birds as the eagles, falcons, owls, and ravens. Some strictly African birds are frequent visitors to the continent, while birds such as the swallow and cuckoo are common to both continents, migrating across the Mediterranean with the seasons. Reptiles are very scarce, the entire continent yielding but fourteen species of snakes and twelve of lizards. There is only one venomous serpent in Europe. Frogs, toads, tree-toads and newts are common. Insect life is numerous and varied, there being especially beautiful and numerous butterflies and many kinds of beetles.

Minerals. Europe is abundantly supplied with coal and iron, which greatly furthers her manufactures. The great Saar basin and the Ruhr district are famed since the World War, when the controversy over their occupation arose. In Russia also are vast undeveloped resources of coal and iron which are being opened to industry as rapidly as possible under the Soviet régime. There are also valuable deposits of gold and silver, especially in the Ural Mountains. Other minerals include lead, zinc, tin, potash, copper, petroleum and salt. Building stone, fire clay and marble also exist in important deposits.

Population. There are no real Europeans as there are Asiatics and Africans, for all the peoples of Europe are thought to have come from Asia in the childhood of the race. The inhabitants belong to the Caucasian and Mongolian races, chiefly, there being nineteen times as many Caucasians as Mongolians. The Caucasians, however, differ greatly among themselves as to language, culture, and physical appearance. The Mongolians include the Finns, Turks, Magyars, and Bulgarians. In spite of the marked differences even within these groups, it is thought they came originally from the Aryan race. According to the 1930 estimate of the International Statistical Institute, the population of Europe is 550,000,000.

Political Divisions. The following is a list of the independent countries of Europe:

Albania, according to the constitution of 1928, is a democratic, parliamentary, independent monarchy.

Andorra valleys have been independent since Carlovingian days.

Austria was made a Federal State in April, 1934.

Belgium is a constitutional monarchy.

Bulgaria has been a kingdom since 1908.

Czechoslovakia was declared a republic in 1918.

Danzig, city and surrounding territory, was made a Free City under protection of the League of Nations, in accordance with the Treaty of Versailles in 1920.

Denmark is a kingdom.

Estonia became a republic in 1918.

Finland became a republic in 1919.

France has been a republic since 1870.

Germany was made a republic in 1918, upon the abdication of the German Emperor.

Great Britain and *Northern Ireland,* kingdom whose ruler is also Emperor of India; which kingdom includes England, Scotland, Wales, Irish Free State and Northern Ireland; also the Isle of Man and the Channel Islands.

Greece has been a republic since 1924.

Hungary, since 1920, has been considered a monarchy with a vacant throne, the functions of a ruler being exercised by a Regent.

Iceland is a kingdom united with Denmark by a personal bond of union under the government of Christian X, since November 30, 1918.

Italy is a kingdom.

Latvia has been a republic since 1918.

Leichtenstein is a principality.

Lithuania has been a republic since 1922.

Luxembourg is a Grand Duchy.

Monaco is a principality.

Netherlands, The, is a kingdom, consisting of eleven provinces, including North and South Holland. The Netherlands is therefore often referred to merely as Holland.

Norway is a kingdom.

Poland became a republic through the Treaty of Versailles in 1919.

Portugal has been a republic since 1911.

Rumania is a kingdom.

Russia proper, known as the *Russian Socialist Federated Soviet Republic* since 1922, is a part of the *Union of Socialist Soviet Republics.*

San Marino is an independent republic within the area of Italy. It claims to be the oldest state in Europe.

Spain became a republic in 1931.

Sweden is a kingdom.

Switzerland is a kingdom.

Vatican City (*Cittá del Vaticano*), comprises the independent territory of the See and Church of Rome, with the Pope as sovereign. Its territory extends over forty-four hectares (108.7 acres).

The following list includes the European colonial dependencies of the various countries:

Italy was given full sovereignty over the Ægean Islands by the Treaty of Lausanne in 1924.

Norway has sovereignty over Spitzbergen, Bear Islands and the adjacent islands, known as *Svalbard;* and the Jan Mayen Island.

History. The early history of Europe is that of Rome, Greece and the Byzantine empire. On the death of Theodosius (395 B. C.) the Roman empire was divided finally into two parts: the Latin empire or Empire of the West, with Rome as its capital; and the Greek empire or Empire of the East, the capital of which was at Constantinople. Beyond the boundaries of the Roman world was a great barbaric people, divided into two parts: the German or Teutonic, next to the western empire; and the Slavonic or Scythian, next to the eastern. The German barbarians were divided into tribes and nations: Goths, Burgundians, Alamanni, Vandals, Longobards, Franks, Angles and Saxons. Farther away were the nomadic Alans. The Slavs, ancestors of the modern Russians, Poles and others, lived farther east and took small share in the history of the time. The Gothic tribes were mostly found in the region between the Vistula, Danube, Black Sea and the Don. This region was invaded by the Huns from Central Asia, and its inhabitants pushed westward, causing the great Gothic invasion. Gaul was overrun chiefly by Visigoths, Burgundians and Franks; Spain by Vandals, Suevi and Visigoths; Africa by Vandals, crossing from Spain. Italy suffered a number of invasions; and Britain, even before being abandoned by its Roman garrison, became as early as 367 a prey to Angles and Saxons. In the latter part of the 8th century the Frankish empire of Charlemagne extended from the Ebro to the Elbe and from the North Sea to Rome, the Franks having conquered both the Goths of France and the Burgundians. The two great divisions of Neustria (the kingdom of the west Franks) and the Austrasia (the kingdom of the east Franks, Franconia, not all corresponding to what was later known as Austria) became the starting points of the kingdoms and nations of France and Germany. Where Hungary is now were the Avars, while to the east of the northern portions of the Frankish realms was the region of Slavonia. Nothing but the little kingdom of Asturia was left of the Gothic power in Spain; the rest formed the Moslem sultanate of Cordova, the Mohammedans having established themselves in Spain in 711. Most of England and part of Scotland were now occupied by the English or Anglo-Saxons. The eastern empire had considerably diminished. In the twelfth century the kingdom of the east Franks was the successor of the western empire, known as the Germanic or Holy Roman empire, extending from the North Sea to the states of the church under the dominion of the popes. In southern Italy was the Norman kingdom of Sicily. Henry II of Anjou was king of England and lord of Normandy, Anjou, Brittany and Aquitaine; the remainder of France being a kingdom under the successor of the kings of the west Franks. In Spain the Christian kingdoms of Leon, Castile and Aragon were growing at the expense of the sultanate of Cordova. Poland and Russia became consolidated states, the heathen Prussians and Lithuanians being their northern neighbors. The Hungarians were in their present dominions; Bulgaria and Servia on the north still limited the decreasing Eastern empire, which on the east was threatened by the Seljuk Turks.

At the Reformation, in the sixteenth century, Charles V was not only emperor of Germany, but king of Spain (the Moslems having been driven out from their last strongholds in Granada), Sardinia, Sicily and Naples, and ruler of the Netherlands and the country of Burgundy. Ferdinand I, archduke of Austria and afterward emperor, obtained by marriage Silesia, Bohemia and a part of Hungary, the rest belonging to Turkey. At the end of the Thirty Years' War (1648) the power of the empire was weakened, while that of France increased, she having acquired most of the kingdom and duchy of Burgundy—she absorbed the country in 1674—and seized Strassburg and its territory in 1681. Savoy was becoming an Italian power. Spain still held the Spanish Netherlands and a great part of Italy. The Protestant Netherlands and Switzerland became independent States. Sweden was one of the great powers, having acquired territories from Germany, Poland and Russia. The ancient possessions of Denmark, in the northern peninsula, Sweden acquired in 1658. The duchy of Prussia became independent of Poland in 1647. Early in the sixteenth century Poland was one of the most powerful states of Europe, a great part of Russia being under its sway. She now lost in power and territory, while Russia steadily grew. Turkey held part of the former Eastern empire, the Austrian princes the remainder. Venice was the most important native Italian power, and Genoa held Corsica till 1768.

Before the French Revolution Poland had ceased to exist as a state; Prussia had risen to greatness and Russia's territory had increased largely; while Sweden had lost the leadership of northern Europe. The Spanish Netherlands belonged to Austria since 1713; and French Bourbons held the parts of Italy that had been Spanish. The French Revolution began a series of changes ending in the extension of Napoleon's empire over Germany west of the Rhine, great parts of northern Germany, the Netherlands and most of Italy; a portion being directly united with the empire; another held separately by Napoleon himself as his kingdom of Italy; while his brother-in-law was king of Naples, and his brother king of Spain. After the fall of the empire France retired within her old limits; the smaller German princes formed a loose confederation, of which Austria assumed the presidency. Italy was parceled out among despotic princes, the Venetian dominions becoming Austrian. The Netherlands became once more a kingdom, but finally separated into Holland and Belgium.

The chief events in European history since the middle of the ninteenth century have been the union of the German states in one empire under the leadership of Prussia, the taking by force of Alsace-Lorraine from France at the close of the Franco-Prussian War; the retirement of Austria out of Germany and her re-organization as the Austro-Hungary Monarchy; the formation of the Italian Kingdom; the lessening of Turkish territory after the different Balkan States secured their independence and the great World War which began in 1914.

For some years preceding the war the features of special interest and significance in the history of Europe were the growing sentiment in England and France and some other countries in Europe for a reduction of expenditure on armies and navies accompanied by the proposal which led to the establishment of The Hague Tribunal for the reference of all international disputes to arbitration. The question of Disarmament has been one of paramount importance since the World War, which altered the face of Europe and also the outlook of the various countries. Revolutions in Russia, Austria-Hungary and Germany accompanying the World War greatly added to the change in Europe politically. The peace settlement and its subsequent modifications far surpassed the changes of previous treaties. Every state of Europe except Portugal, Spain and Switzerland was involved, directly or indirectly. Three empires were dismembered, eight new national states appeared, and the new era of political history begun. It passed through a chaotic period after the fixing of war guilt upon Germany, and involving the immoderate appetite of the former Powers for the spoils of war. The Dawes Plan in 1924 ushered in a new period with the beginning of a reasonable attitude toward reparations and a temporary working plan which served until the Young Plan was adopted in 1929. This period was marked by the important Treaty of Locarno in 1925, and the Kellogg-Briand pact for the renunciation of war, in 1928. The work of the League of Nations has been significant. Most marked in recent years has been the rise of Soviet Russia, and the growing power of Hitler in Germany, Mussolini in Italy, and Dollfuss in Austria, terminating in the assassination of Dollfuss but continuing his party policies.

For further information see the following articles:

Countries: ALBANIA; AUSTRIA; BELGIUM; BULGARIA; CHANNEL ISLANDS; CORSICA; CRETE; CYPRUS; CZECHOSLOVAKIA; DENMARK; ENGLAND; FINLAND; FRANCE; GERMANY; GREAT BRITIAN; GREECE; HOLLAND; HUNGARY; ICELAND; IRELAND; ITALY; LATVIA; LITHUANIA; LUXEMBOURG; MONACO; NETHERLANDS, KINGDOM OF; NORWAY; POLAND; PORTUGAL; RUMANIA; RUSSIA; SAN MARINO; SARDINIA; SCOTLAND; SPAIN; SWEDEN; SWITZERLAND; WALES.

Mountains: ALPS; BALKAN MOUNTAINS; BLANC, MONT; CARPATHIAN MOUNTAINS; CAUCASUS MOUNTAINS; JUNGFRAU; MATTERHORN; PYRENEES; TYROL.

Rivers: DANUBE; DNEIPER RIVER; DON RIVER; DVINA RIVER; ELBE RIVER; GUADALQUIVER RIVER; ODER RIVER; PO RIVER; RHINE RIVER; RHONE RIVER; SEINE RIVER; TAGUS RIVER; THAMES RIVER; VISTULA RIVER.

Seas: ÆGEAN SEA; AZOV, SEA OF; BALTIC SEA; BLACK SEA; CASPIAN SEA; MEDITERRANEAN SEA; NORTH SEA; WHITE SEA.

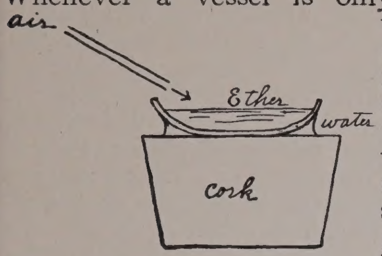
Cities: ABERDEEN; AMSTERDAM; ANTWERP; ARAGON; ATHENS; BERLIN; BORDEAUX; BUDAPEST; FLORENCE; MOSCOW; NAPLES; PARIS; PISA; ROME.

People: ALBERT; ALEXANDER; ALFONSO; CHARLEMAGNE; COSSACKS; ETRUSCANS; FASCISM; GEORGE V; HINDENBURG VON, PAUL; HITLER, ADOLF; MUSSOLINI, BENITO; NAPOLEON, I.

Evans, Robley Dunglison, a famous American naval officer, was born in Floyd County, Virginia, on August 18, 1846. He was graduated from the United States Naval Academy in 1863. He first served in the West Indies, and later with the North Atlantic blockading squadron. He took part in January 1865 in the attacks on Fort Fisher, in which he was twice wounded. In 1866, he returned to the service as a lieutenant. He became lighthouse inspector in 1882, and served four years. In 1891-92 he commanded the *Yorktown* at Valparaiso, Chile, where American sailors were killed by a mob. He there earned the name of "Fighting Bob," by which he was ever after known to seamen. He policed the Bering Sea sealing grounds. In 1893 he became captain, and in 1896 commanded the *Indiana,* the first battleship commissioned by the United States. He commanded the *Iowa* in the war with Spain, taking part in the bombardment of the forts of San Juan and Porto Rico, and withstanding the fire of the entire Spanish fleet with his ship during the battle of Santiago. In 1898 he was detached at his own request, and made a member of the Board of Inspection and Survey. He was given the rank of rear-admiral on February 11, 1901. On his recommendation, steel was first used in American battleships. In 1904, he commanded the fleet in the Far East, and in 1907, commanded the fleet which left Hampton Roads for a cruise around the world. He was forced by ill health to give up the command. He was retired in that year, with the thanks of the Navy Department. He died on January 3, 1912.

Evanston, a city in Cook County, Illinois, and a suburb of Chicago, is situated on the shores of Lake Michigan, twelve miles north of Chicago. It is a beautiful city, ideally located, with excellent residential sections. It is the seat of Northwestern University, and the Garrett Biblical Institute. There are also Swedish, Danish and Norwegian Theological schools located here. A fine public and parochial school system is maintained. Evanston is the national headquarters of the Woman's Christian Temperance Union. The city was incorporated in 1890, having been settled about 1835. Its government is administered by a mayor who is elected biennially, assisted by a unicameral city council. The population of this rapidly growing city in 1930 was 63,338.

Evansville, a city, port of entry, and the seat of Vanderburg County, Indiana, is situated on the Ohio River, 150 miles southwest of Indianapolis, and about halfway between Louisville and Cairo. It has handsome government buildings, four public libraries, an art gallery, and about fifty churches. The school system is excellent, including the Junior High School. The city is in the center of an important coal district, and also has a large trade in timber, grain, pork, tobacco, and flour. Abundant water power furthers manufacture. Industries include foundries, machine shops, furniture, glass, leather factories, and cotton and woolen goods. There is an extensive hardwood trade in lumber and products. The commercial importance of Evansville is aided by its central station, which makes it the chief shipping point in Southwestern Indiana. Population, 85,000.



EVAPORATOR

Evap'oration is the process by which a liquid body changes into a gaseous body. Whenever a vessel is only partly filled with a liquid substance, it is found that the remainder of this vessel always contains some of this substance in a gaseous form. This gas is called vapor. If the vessel be closed, it is found that, at any one temperature, this process of evaporation will go on until the vapor exerts a certain definite pressure—known as the vapor-tension of that substance at that temperature. What is very curious is that this vapor-tension is independent of any other gases that may be present over the liquid. It is not to be supposed that evaporation ceases when the vapor pressure reaches a maximum; but rather that, at this point, as many particles are leaving the vapor to enter the liquid as are leaving the liquid to enter the vapor. The rate at which evaporation proceeds depends very greatly upon the amount of vapor already present over the liquid. Accordingly, anything which diminishes the amount of vapor already over the liquid will increase the amount of evaporation. It is in this manner that a spoonful of tea may be cooled by blowing over it. For by blowing away the vapor we increase the evaporation. Since the average kinetic energy of a particle of vapor is very much greater than the average kinetic energy of a particle of liquid, it is clear that evaporation must rob the liquid of energy and thus cool it. If a watch-glass be placed on a cork with sulphuric ether on the glass and water underneath the glass, as shown in the figure, the water may be frozen almost immediately by simply blowing a steady stream of air over the surface of the ether. The vapor-tension of ether is high even at ordinary temperatures, so that evaporation is rapid. Since the latent heat of the vapor is derived from the heat in the ether, glass and water, the water is quickly frozen.

Another method of increasing evaporation is to increase the surface of the liquid. A pint of water in a large flat pan will evaporate much more rapidly than the same amount of water in an ordinary tin cup. Still another method of hastening evaporation is to place the liquid under the receiver of an air-pump and pump the vapor off. Strong sulphuric acid, which greedily absorbs water-vapor, will act in the same way. By combining these two methods (*i. e.*, placing both water and suphuric acid under the receiver of an air-pump) Leslie succeeded in freezing the water by evaporating it at the expense of its own heat.

Sometimes a solid evaporates directly without passing through the liquid state. Such a process is called sublimation. This is easily observed in the case of camphor and iodine. When a liquid is heated to the point where evaporation is no longer confined to the surface of the liquid but begins in the interior of the liquid, we call the process ebullition, or boiling. The temperature at which this occurs is called the boiling point. Evidently the boiling point may also be defined as that temperature at which the vapor-tension of a liquid is equal to the pressure of the atmosphere.

WILLIAM M. EVARTS

Ev'arts, William Maxwell, American lawyer and statesman, was born at Boston Feb. 6, 1818, and died at New York city, Feb. 28, 1901. He graduated at Yale, and was admitted to the New York bar in 1841, where he built up a notable practice,—receiving as high as $50,000 for an opinion in a case. He was chief counsel for President Johnson in the impeachment trial in 1868, and was United States attorney-general to the close of Johnson's administration. He was United States counsel before the Alabama tribunal in 1872, and senior counsel for Henry Ward Beecher in 1875. In 1877–81 he was secretary of state, and United States senator for the term 1885–91.

Ev'erest, Mt., a peak of the Himalayas, in Nepal, is the highest point yet found on the earth, rising to an elevation of 29,002 feet above the sea. It was named in honor of Sir George Everest, surveyor-general of India.

Ev'erett, Edward, American statesman and orator, was born at Dorchester, Mass., on April 11, 1794. He graduated at Harvard College with the highest honors at the age of 17, where he had been the principal editor of the *Harvard Lyceum*, one of the first college papers founded in the country. When but 19, he became pastor of Brattle Street Church at Boston. He was appointed professor of Greek at Harvard, took a two years' course of study at Göttingen University in preparation for it, and entered upon his work in 1819. He delivered a course of lectures in the university on Greek literature and art, which was so popular that he repeated them in Boston to large audiences. He wrote over 100 articles for the *North American Review*, of which he was editor for a few years. When he was elected to Congress, in 1824, his public life began. He served ten years, holding positions on important committees most of the time. From 1835 to 1839 he was governor of Massachusetts, and in 1840 was sent to England as minister of the United States. He secured for American seamen the right to fish in the Bay of Fundy, this being the first agreement between England and America on the subject of the fisheries. In 1845-48 he was president of Harvard College. He was secretary of the state for a few months, and again senator from Massachusetts for a short time, and was nominated for vice-president in 1860. His long course of public addresses and lectures, which made him so well known, began in 1824 with an address before the Phi Beta Kappa Society at Harvard College. In 1853 he prepared his address on *Washington* for the benefit of the Mount Vernon Association. It was delivered first before an immense audience in Boston, and repeated in different cities and states nearly 150 times. He also wrote a weekly article for the *New York Ledger*, realizing $10,000 for the benefit of the same association. Not including his expenses and his time, Mr. Everett gave $100,000 to the Mount Vernon fund. In 1863 he delivered an address at the dedication of the national cemetery at Gettysburg. He died at Boston, Mass., January 15, 1865.

Ev′erett, Mass., a flourishing city in Middlesex County, Mass., adjoining Boston and reached from it by a branch of the Boston and Maine Railroad and also by electric cars. Prior to 1870 it formed part of Malden, but in 1893 it was separately incorporated. It possesses good schools, churches and many fine residences of Boston merchants. Its industries include extensive chemical works, manufactories of rope, wheels, baby-carriages, and gas, coke and steel works. It also has two good public libraries. Population (which has increased rapidly in the past decade) 50,000

Everett, Wash., the county-seat of Snohomish County, about 35 miles north of Seattle on Puget Sound. The surrounding region is an agricultural, lumbering and mining section. Among its leading industries are saw and paper mills, railroad and machine shops, shipyards and the manufacture of lumber products, etc. Everett has fine public schools and a public library, a hospital, and located here are the United States customs and assayer's offices. The city was settled in 1891, but its fine harbor and excellent railroad facilities have aided in its rapid growth to a substantial and modern city of about 30,000 population.

Ev′erglades. A large, shallow lake or marsh in southern Florida, 160 miles long and 60 broad. It incloses thousands of islets, which have a very rich soil and are covered with dense thickets, and contain great numbers of alligators. From this district Florida is sometimes called the Everglade State.

Evolution. Although evolution is a word in constant use, there still is great vagueness in the minds of most people as to what it stands for. In its broad sense it has come to mean the development of all nature from the past. If we think of the long train of events in the formation of the world and peopling it with life, we may look upon this story, figuratively, as written on a scroll that is being unrolled. Everything that has come to pass is on that part so far unrolled, and everything in the future is still covered but will appear in due course of time. Thus, evolution in its broadest sense may mean the unrolling of the scroll of the universe, including the formation of stars, solar systems and the elements of the inorganic world as well as of all living nature. But the word as usually employed is limited to organic evolution, or the formation of life upon our planet, and in this sense it is used throughout this article. It is a common mistake to suppose that Darwinism and evolution are the same, and there also is much misunderstanding as to the nature of the entire question. Hence we should first get a clear idea of what evolution is, then of the basis upon which it rests, and finally trace the growth of evolutionary thought, especially in the 19th century. Evolution, as used in biology, is a history of the steps by which animals and plants came to be what they are. The great variety of animals and plants is amazing. The water, the earth, the air teem with life; the fishes of the sea are almost innumerable; and in a single group of the insect world — the beetles — there are upwards of 50,000 species known and described. In addition to the living animals, there is entombed in the rocks a great multitude of forms that lived eons ago and became extinct. In view of all these forms the question comes at once to the mind: How shall we account for this great diversity of organic life? Have the great variety of forms existed unchanged from the days of their creation to the present, or have they, perchance, undergone modifications, so that one original form may have, through its descendants, emerged into different kinds? This is not merely an idle question, insoluble from the very nature of the case, for the present races of animals and plants have a long lineage reaching into the past. and it is a historical question to be answered by trying to discover their parentage. We shall see that there is good reason to believe that the higher animals have been derived gradually from simpler ones, including with the higher animals, also, the body of man. The very general acceptance of this view in the latter part of the 19th century, under the title of the doctrine of evolution, has made an epoch. It has had great influence, perhaps the greatest of any one doctrine, in modifying the point of view in many fields of thought. It is, therefore, so important that all intelligent people ought to know what the doctrine is. By way of clearing the ground it may be repeated that it is not a question of creation through Divine agencies or non-creation, but a question of method of creation. It is not a theological question, but an historical one. Nevertheless, when the doctrine arose with new force about 1860, it found itself in conflict with theological ideas and especially with the doctrine of creation called special creation. It is natural to think that the latter was a view held by the early theologians and Fathers of the church, but it is instructive to find that some of them, such as St. Augustine, openly expressed the opinion that God created all things "in the germ." The doctrine of special creation was introduced into English Protestant thought through the epics of John Milton, to whose forceful and picturesque language we have been indebted for many of our accepted dogmas, without having paused to examine into them.

The question of the parentage of animals involves the distant past. The very center of it is this: Are species fixed and permanent, as Linnæus, the great Swedish botanist and naturalist, supposed; or do they change? If it can be shown that species (or particular kinds of animals and plants) change so much as to be recognized as different kinds, then there has been evolution. If, on the other hand, the evidence shows that species are fixed, there has been no evolution. It is well-known that by cultivation we can produce varieties of flowers, and by breeding we can produce different kinds of pigeons, fowl, and stock. Therefore, living beings may change through changes in their surroundings. But we must bring the history of past ages to bear upon the question. Fortunately there are preserved in the rocks the petrified remains of animals, showing their history for many thousands of years, and we may use them to test the question. It is plain that rocks of a lower level were deposited before those that cover them. Now, in Slavonia we have some fresh-water lakes that have been drying up from geological times. All through the ages these waters were inhabited by snails, and the first formed ones were parents of the later broods. As the animals died, their shells fell to the bottom and were covered by mud and débris, and held there like currants in a pudding. In the course of ages these layers thickened and were changed into rock, and thereby we have shells preserved in their proper order of birth and life, the most ancient ones at the bottom and the newest at the top. We can sink a shaft or dig a trench, and collect the shells and preserve them in proper order. Those nearest the top are descended from those near the bottom, but are very different. No one would hesitate to name them different species, in fact naturalists made six or seven different species when these shells were first examined. If, however, the whole collection were laid out in a long row in proper order, while those at the ends would be very different, if we begin at one end and pass to the other, the shells all grade into one another by such slight changes that there is no line showing where one kind leaves off and another begins. This shows their history for thousands of years: The species have not remained constant, but have changed into other species. We have other examples of similar conditions in Württemberg, which show that shells may change not only into different species but into different genera so gradually that one cannot tell where to separate one kind absolutely from another. But we have more perfect and more remarkable series than those mentioned, involving higher animals. For example, there is contained in the rocks of our western states the complete history of the horse-family—written as it were on tablets of stone—and extending over a period of more than 2,000,000 years. Geologists can, of course, measure the thickness of rocks and form some estimate of the time it took to have them deposited, for the rocks that lie in layers or strata were deposited layer by layer, usually by water. In the deposits near the surface we can find remains of the immediate ancestors of the horse of to-day, and there is but little change. In lower rocks we can come upon the forms from which these were derived, and so on, as long as the record holds out. If in this way we go into the past a half-million years, we find the ancestors of the horse reduced in size and with three toes on the fore and hind feet. The horse has now only a single toe on each foot, but small splint-like bones that represent the rudiments of two more. If we go back 1,000,000 years, we find three toes and the rudiment of a fourth, and, going back 2,000,000 years, we find four fully developed toes and bones in the feet to support them. It is believed that in still older rocks a five-toed form will be discovered, which was the parent of the four-toed form. To sum up this evidence: The parentage of the horse is surely from animals with four (and possibly five) toes, not like the horse of the present day. Therefore, horses have been evolved, not originally created as we see them to-day. We have treated our question as an historical question, and have gone searching for clues in the past as an archæologist explores the past of buried cities, by digging, and collecting coins, implements, records, etc. and putting the facts together into a history. In the museums at Yale University are preserved upward of 30 steps or stages in the history of the horse-family, showing that it arose by evolution or gradual changes from a four or five-toed ancestor about the size of a fox and that it passed through many changes besides increase in size in the 2,000,000 years in which we can get facts as to its history. These facts, taken in connection with a multitude of others pointing in the same direction, give us the answer to the question: Were the immense number of living forms created just as we find them, or were they created by a process of evolution?

The series of shells and horses mentioned above are called evolutionary series. They were not known at the time of the publication of Darwin's great book on *The Origin of Species.*

The most interesting evidences of evolution bearing on all animal life are found in the various stages through which animals pass on their way from the egg to the fully formed animal. Every animal, above the Protozoa, begins its life as a single cell and passes through every gradation from that condition upward. As animals develop in this way, they become successively more and more complex, and many rudimentary organs arise and disappear. For example, in the young chick, developing within the hen's egg, there appear, after four days, gill-slits or openings into the throat, like the gills of lower fishes. These organs belong entirely to water-life, and are not of direct use to the chick. The heart and blood-vessels at this stage are also of the fish-like type, but all this disappears in a few days, long before the chicken is hatched. Similar gill-slits appear also very early in the development of the young rabbit and of all higher animals. The best way of explaining their presence—which certainly means something—is to say that they are inherited from remote parents. Animals in the course of their development repeat certain stages of their past histories. The presence of gill-clefts in the embryos of birds and rabbits probably means that both these animals sprang from ancestors that had gill-clefts, or water breathing animals. Such traces are like hieroglyphics and inscriptions on temples and columns—they are clues to ancient history and they weigh heavily on the side of evolution. If space permitted, the evidences in favor of evolution might be very much multiplied.

Having illustrated what the doctrine of evolution is, the main part of our task is done, for the questions regarding the different theories of evolution and the rise of evolutionary thought must be dealt with very briefly, and the reader directed to the best books for further information. The doctrine of evolution is regarded as established beyond controversy. The controversies about evolution to-day are not as to whether it was or was not the method of creation, but as to how evolution of different forms was brought about. Therefore we must distinguish between the facts of evolution and the factors. Although several theories have been advanced to account for evolution, only three command any particular amount of attention at the present time: those of Lamarck, Darwin and Weismann. Lamarck's theory was founded in the early part of the 19th century. Being greatly impressed with the differences produced in animal-life by surroundings—climate, temperature, moisture, elevation above the sealevel, etc., he came to believe that all variation in animals had been produced by different surroundings, and the effects of use and disuse of organs. The use of the muscles of the blacksmith's arm, for example, develops it greatly; the disuse of the wings of the wingless birds has led to the disappearance of their wings. The differences thus produced are inherited. While the explanation of Lamarck has two factors, that offered by Darwin has three. He showed that animals vary in a state of nature, that these variations are inherited and, thirdly, that nature selects the fittest to survive, through the failure and death of the weaker ones in the struggle for existence. The variations that prove of advantage to the individual would be the ones preserved and handed along by heredity. This theory was arrived at, independently, by A. R. Wallace, and should be known as the Darwin-Wallace theory of natural selection. But this is not evolution; it is an attempt to explain *how* evolution was brought about. Weismann's theory is difficult to state briefly and clearly. It is called the theory of continuity of the germ-plasm. He accepts Darwin's natural selection, and shows that the germ-plasm, or substance from which animals arise, is continuous from generation to generation. Heredity is explained in a simple way, viz., the offspring is like the parent, because some of the same stuff enters into all its cells. He concludes, further, that the germ-plasm must be impressed by surroundings before changes in the animal can be inherited. The theory of Weismann is losing ground while Mendel's ideas have exerted fully as much influence as Darwin's. Mendel (*q.v.*) discovered that a certain characteristic of one parent, for instance tallness in the common pea, tends to overcome in the offspring another characteristic—e. g. shortness—when a tall and a short individual are mated, and that the number of tall and short descendants can be mathematically computed according to a definite law. This rule applies to all characteristics, though only a few of its phases have been worked out in the case of human beings, and the whole question is immensely complicated.

Let us now look briefly at the rise of the doctrine of evolution. Osborn has shown that there is a continuous train of thought along this line from the Greeks to Darwin, but modern evolution began at the close of the 18th century and did not fairly take hold of the minds of people till after 1859. Linnæus (1707-78), by defining species and giving them names that were adopted all over the world, directed the attention of naturalists to species, and thus made possible a consideration of the origin of species. He considered them fixed and unchanging. His contemporary, Buffon, gradually grew to the idea that the higher forms of life were derived by modifications from the lower ones. These views were warmly supported by Erasmus Darwin, the grandfather of Charles, and by the poet-naturalist Goethe. Lamarck, however, was the first fully to grasp the idea of evolution in its entirety. His book dealing with the subject (*Philosophie Zoologique*) was published in 1809, but his views were strongly opposed by Cuvier. They were shared by his friend Geoffroy St. Hilaire, and a noteworthy public debate took place at Paris in 1830 between St. Hilaire and Cuvier on the question of organic evolution. Cuvier won by weight of authority and greater brilliancy. An important step in preparing the way for Darwin was taken by Charles Lyell in his *Principles of Geology* (1830), in which he showed that, if we would know what occurred in the past, we must observe the agents that produce changes in the present and read the past in terms of the present. Herbert Spencer in 1852 published a remarkable article on evolution, that came near anticipating Darwin. Wallace and Darwin arrived at the same explanation independently, and in July, 1858, their views were published together. Next year Darwin published his *Origin of Species.* This had a compelling power, and at once attracted wide attention, partly because the time was ripe, but mainly because he had a better explanation to offer than any previous thinker. The general theory of evolution had a long conflict with religious and philosophical dogma over which it finally triumphed. Huxley in England and Haeckel in Germany were especially active in promoting the ideas of Darwin. Later, Mendel's laws of heredity have opened a vast new field of biological knowledge. The following books are recommended: Romanes, *Darwin and after Darwin*, Vol. I.; Wallace, *Darwinism;* Fiske, *Destiny of Man;* Osborn, *From the Greeks to Darwin;* Darwin, *Origin of Species*; Weismann, *The Germ-Plasm;* Romanes, *An Examination of Weismannism;* Batesman, *Mendel's Principles of Heredity.*

GENERAL EWELL

Ewell (*ū'ĕl*), **Richard Stoddert,** a Confederate general, was born at Georgetown, D. C. in 1817, served in Mexico and against the Apaches, and was actively engaged throughout the Civil War. In 1862 he distinguished himself under Jackson, losing a leg near Bull Run in August; and, having been promoted to lieutenant-general, he served gallantly at Winchester, Gettysburg and the Wilderness. At Sailor's Creek, however, he was captured, with his entire force, April 6, 1865. He died at Springfield, Tenn., Jan. 25, 1872.

Ewing (*ū'ing*), **Thomas,** an American statesman, was born in Virginia in 1789. He fitted himself for college by night-study while at work in the Kanawha salt-works. He graduated at Ohio University at Athens, O., receiving the first degree of A. B. ever given in that state. He was admitted to the bar in 1816, and was soon known as one of the first lawyers in Ohio. He was United States senator from 1831 to 1837, secretary of the treasury in 1841, and in 1849 he organized the newly-created department of the interior, returning afterward for a time to the senate. He was strongly opposed to slavery, voting against the fugitive-slave law and for the abolition of slavery in the District of Columbia. He introduced many improvements in the postal service. He died at Lancaster, O., on Oct. 26, 1871.

Excal'ibur, the sword of King Arthur, according to the legends, was given to the king by the Lady of the Lake, to whom it was to be restored at his death. Tennyson weaves a beautiful legend of how Sir Bedivere, being ordered by Arthur to cast the brand into the mere, twice hides the gleaming weapon before the reproaches of the king induce him to obey. A white hand caught the flying sword and drew it beneath the surface of the lake. See *The Passing of Arthur.*

Excursions, School. Out-door excursions with school-children for purposes of education have in recent years become a well-recognised mode of enlarging their ideas and range of experience. The main purposes of such excursions are to bring children in contact with the great outside world by direct experience and observation; and to give more reality to study;

make it less bookish and verbal; and make it more objective and concrete, more experimental.

All studies deserve to be based as far as possible upon direct experience. There, however, are certain studies which especially demand outdoor work and more or less extended excursions away from the school-house.

The chief classes of excursions may be stated thus:

1. Nature-study excursions. It is generally admitted that plants and flowers, birds and bees, butterflies, rocks and soils, field and country can best be seen and studied in their natural habitat. Books can not take the place of these outdoor conditions, and a close observation of these real objects in their relations to one another is the best kind of teaching.

2. In primary geography much of the work should be done out of doors, visiting the hills, valleys and streams of one's neighborhood, the shops and factories of one's native town, studying the commerce and shipping by wagons, railroads and by water, the construction of houses, the local political interests of the town and also the weather-conditions and changes of season. Children can not get these first experiences out of books, and the excursion is especially suitable to these topics in home geography.

3. Places of local historical interest are visited. Many neighborhoods have such spots, where the Indians lived, where the first settlers built, where the oldest buildings stand, where eminent men have lived or performed important deeds. Some towns have museums where old relics and mementoes of historical interest are preserved and may be seen by the children.

4. It is not unusual now to take children on a visit for a day or more to the state capital, the state university or some place of great scenic interest or to some large city, as Chicago or Cleveland, New York or San Francisco. The museums of fine arts in some of our cities are especially worthy of visitation by school-children, as the Metropolitan Museum in New York, the Art Institute in Chicago, the Carnegie Institute in Pittsburg, etc.

5. A visit to the city of Washington from those states near enough to allow it is of special interest for the purpose of seeing public buildings, monuments, etc.

Excursions have long been generally introduced into the schools of Germany. It is not unusual for a teacher in Germany to set off with a group of boys for a trip of two or three weeks through some interesting region, such as the Thuringian Forest, or the Harz Mountains, visiting famous scenic resorts, climbing mountains, seeing the places made famous by great men, cities and towns, churches and noted buildings, etc.

There are some serious difficulties to be considered in excursions with children. It is a great burden and responsibility to take charge of children upon such excursions. Most teachers prefer to keep children orderly in the school-house. It is expensive to transport children to any considerable distance in large cities by street-car or boat or by railroad. In visiting factories and shops certain dangers and interferences must be avoided.

In spite of these troubles and difficulties the advantages are so great that the tendency to extend the excursion is growing, and they are likely to be much more generally introduced in the future.

Many nature-study books suggest good excursions, as follows: *Field-Book of American Wild-Flowers* (Mathews); *Birds of Village and Field* (Merriam); *A Guide to Trees* (Lounsberry); *Life in Ponds and Streams* (Furneaux); *How to Read a Pebble* (Charles), *Outdoor Studies* (Needham); *Excursions and Lessons in Home-Geography* (McMurry); and *My Saturday with a Bird-Class* (Miller). C. A. McMurry.

Ex'eter, England, the capital of Devonshire, 171 miles from London, is "as good a specimen of an English county-town, at once prosperous in business and with a quiet air of aristocratic distinction, as can be found within the four seas." It is built on the summit and slopes of a flat ridge, rising 150 feet from the left bank of the Exe, and as a seat of commerce and industry has been left behind by many younger cities. Its woolen trade, once second only to that of Leeds, is a thing of the past, but it is yet the chief market of Honiton lace. It also has large nurseries and manufactures of gloves, agricultural implements, etc. A ship-canal extends five miles to the tideway. St. Peter's cathedral is a long, low edifice with massive towers. These towers are the original Norman ones (1112). The town has a picturesque guildhall (1464); while the Devon and Exeter hospital (1743), the lunatic asylum (1865) and the Albert Memorial Museum (1868) are the most noteworthy of modern buildings. It had a stormy time from 876, when it was captured by the Danes, down to 1688, when William of Orange entered it. The tragic burning of the new theater, Sept. 5, 1887, entailed a loss of 188 lives. See *Exeter*, by Freeman, in the Historic Towns Series. Population 48,660.

Exeter Hall is a large building situated on the Strand in London, England, completed in 1831. It will seat over 5,000 persons. It is rented chiefly for religious assemblies, and is in great request during the May meetings of religious societies. Many fine musical concerts have been given in it. In 1880 it was purchased for the Young Men's Christian Association for $100,000.

Explosives may be either mere mixtures, such as gunpowder, or chemical compounds, such as nitroglycerin. They may all be made to explode under sufficient heat; for example, dynamite or nitroglycerin at 180° C., blasting powder at 270°C. and rifle-powder at 270°C. The oldest of the explosives is gunpowder, which is a mixture of potassium nitrate, sulphur and charcoal, in some such proportion as 75 per cent., 10 per cent. and 15 per cent. respectively. The principle of explosives is to bring oxygen into very close contact with combustible substances. Thus even finely powdered wood-dust in the air may be an explosive. When the combustion is simultaneous, it is called detonation. The powerful explosive called guncotton, discovered in 1845, is made by treating cellulose with nitric acid. Guncotton is used in smokeless powder. Nitroglycerin, discovered in 1847, is made by treating glycerin with a mixture of nitric with sulphuric acid. Dynamite is made by combining nitroglycerin with an absorbent substance that prevents it from decomposing, as it would otherwise do. Explosives, chiefly for military use, are an important item of manufacture in the United States and the total value of these products increased from $10,993,131 in 1890 to $40,139,661 in 1909.

Expositions. National and international exhibitions or expositions of manufactures, arts, commerce, agriculture and mining are a feature of the present and the recent century. The first of any importance was held at Paris in 1798, and for half a century these displays were held every three years. In this, as in other things, Paris set the fashion. Between 1820 and 1850 exhibitions were held at Vienna, Berlin, Brussels, St. Petersburg, Stockholm, Moscow, Lisbon, Madrid, Dublin, Manchester, Leeds, Birmingham, New York, Philadelphia and many other cities. The first really national exposition in England was held in 1851 at the Crystal Palace, London; and the first of great importance in the United States was held in New York in 1853. The idea was also adopted in the east, and a large exposition was held at Constantinople in 1863. These great industrial shows had now become quite common events, and we need only mention as instances in the next few years the magnificent Paris Exposition of 1867 and the one at Vienna in 1873. The Philadelphia Centennial Exposition of 1876 was held in commemoration of the hundredth anniversary of American independence. Other recent expositions in this country have been those at Louisville in 1882 and at New Orleans in 1884. The Paris Exposition of 1878, which surpassed all others before it, was overshadowed by the Universal Exhibition of Paris in 1889. The Eiffel Tower (which see), wonderful as it was, was rivaled by the Machinery Palace, which had a span of 377 feet, but was without pillars or like support.

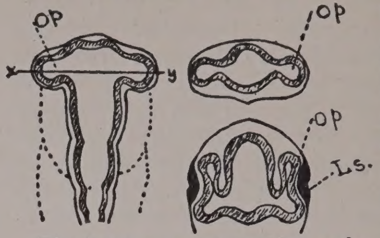
The World's Columbian Exposition, in Chicago in 1893, far exceeded all its predecessors. The opening of this century was marked by two industrial exhibitions of some magnitude and attractiveness, one at Glasgow, Scotland, and the Pan-American Exposition at Buffalo, N. Y. The design of the latter was to illustrate the progress of the age in science, arts and industries. The exposition also had for its object to promote trade among all American countries and to present an object-lesson showing the industrial development of the continent. Part of its motive-power was obtained from the Falls of Niagara. The St. Louis Exposition of 1903 was held to commemorate the centenary of Jefferson's purchase of the Louisiana territory; the Portland, Oregon, Exposition of 1905 memorialized Lewis and Clark's conclusion of their exploration of the new acquisition; and the Jamestown, Virginia, Exposition celebrated the tercentenary of the founding of the first English colony in the United States. Seattle, Washington, held an Alaskan Exposition in 1909. The Panama-Pacific Exposition held in San Francisco in 1915 jointly celebrated the 400th anniversary of the discovery of the Pacific and the opening of the Panama Canal. In spite of the war raging in Europe at this time, this Fair was a splendid success and surpassed all previous efforts.

Express Companies. This is an American system organized for the speedy transmission of parcels or merchandise of any kind and their safe delivery in good condition. It began in the trip made from Boston to New York by William Frederick Harnden (1813–45), the first "express-package carrier," on March 4, 1839. The plan recommending itself to business men, competing companies sprang up rapidly, and express lines were established in all directions. Adams & Company's California express was started in 1849; Wells, Fargo & Company's in 1852; the American-European Company in 1855. As railroads extended, the early "pony express" disappeared, and individual companies made contracts with the railroad companies, their business over these routes being held to be entitled to the protection of the courts against any efforts to dispossess them. Many of the rival companies united, and now are joint-stock institutions, employing capital amounting to over $50,000,000. A feature of the system is the "collect on delivery" business—goods to strangers being marked C. O. D., with the amount to be collected, the express company making the collecting and forwarding "returns" to the shipper. Money-orders also are issued, payable at any of the numerous offices throughout the United States. They are received at banks from depositors. and are often preferred as cheaper and safer than checks or postal orders for small remittances by mail. See A. L. Stimson's *History of the Express Business.*

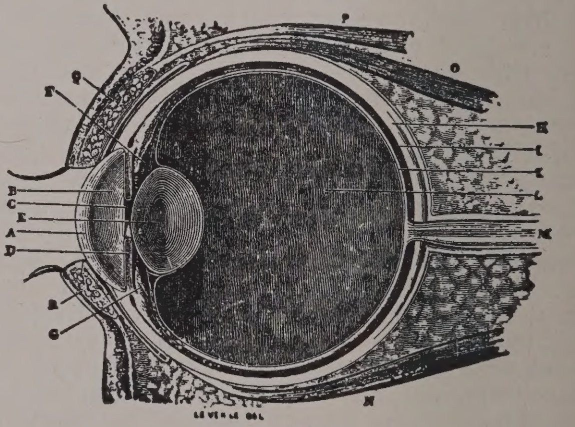
Extradition is the surrender of a prisoner accused of a crime by the government in whose dominions he has taken refuge to the government of which he is a subject, so that he may be punished or dealt with according to its laws for an offense committed within its jurisdiction. The crimes for which extradition may be demanded comprise murder, manslaughter, counterfeiting and forgery, embezzlement and larceny, obtaining money or goods on false pretenses, etc. Between this country and Great Britain the offenses number nearly 30 that are extraditable, though political offenses are excluded, as they usually are in all international treaties. Since the assassination of President Garfield provision has been made in the treaties of this country with foreign powers that attempts against the head of the state, in the way of assassination, murder or poisoning, shall not be deemed political offenses, and so they are extraditable. The rendition, in this country, of criminals or fugitives from justice from one state to another is provided for by the constitution; the state making demand for the return of the criminal paying the costs connected with the arrest and surrender of the person extradited.

Eyck (*īk*), **Hubert** and **Jan van,** two illustrious painters of the early Flemish school. They probably were born at Alden Eyck or Masseyck on the Maas, but the date of their birth is uncertain; Hubert is supposed to have been born about 1370 and Jan about 1389. The distinction of being the inventors of oilpainting is claimed for them, though evidence exists that it was practiced previously. But the Van Eycks were the first who brought into notice and perfected the mode of mixing colors with oil. For transparent and brilliant coloring and minute finish their works have never been surpassed. Jan seems to have been instructed in art by his elder brother and to have worked with him as court-painter to Philip of Charolais till 1422, when he entered the service of John of Bavaria, count of Holland, at The Hague; and in 1425 he was appointed painter to Philip the Good, Duke of Burgundy, practicing his art chiefly at Bruges. Hubert continued to reside in Ghent, and at the time of his death, Sept. 18, 1426, was engaged upon an important altarpiece, which was completed by Jan. The masterpieces of the brothers are mostly met with in Ghent, Bruges, Antwerp, Berlin, Munich and Paris. Three pictures of Jan's are in the National Gallery, London, dated 1432, '33 and '34. In the Louvre, Paris, is his exquisitely finished little picture of *Chancellor Rollin kneeling before the Virgin.* Jan died at Bruges on July 9, 1440. See *Early Flemish Painters* by Crowe and Cavalcaselle.

Eye, the organ of sight. In some single-celled animals there is a colored spot sensitive to light, and from this simple condition to the complicated eye there are many gradations. In worms, insects and mollusks the eye develops from the surface-layer of cells by their becoming thickened and sometimes folded in. This is called a skin-eye. Nerve fibers grow from surface cells and pass to the brain. In the vertebrated animals the eye comes from a portion of the brain-wall, and has been called a brain-eye. But if the matter be looked at in an unprejudiced way, we shall see that the brain-wall at first was on the outside and, therefore, a portion of the surface layer of cells. The brain is formed by the rolling together of the outer layer of cells in such a way as to form a hollow tube, the walls of which become bulged out in several places, forming a row of enlargements or cavities. The eyes first appear as pockets or bulges (*op* in the illustration) from the front cavity of the brain; in this condition they are called optic vesicles. An optic vesicle is converted into an optic cup by changes best explained by reference to the illustration. The lens (*Ls*) is set free from the outer layer of cells and the wall of the original vesicle (*op*) becomes folded in to form a sort of cup, connected to the brain by a stalk. This is the beginning of the eyeball. The eyeball when fully formed consists of three coats: Sclerotic, the tough outer coat; choroid, the dark middle coat, and retina, the delicate inner coat about $\frac{1}{80}$ in. thick. The main cavity of the eyeball



The head-end of the embryo of a bird showing the formation of the optic vesicles (*op*) and the lens (*Ls*). The figs. on the right are sections through the head.



THE EYE

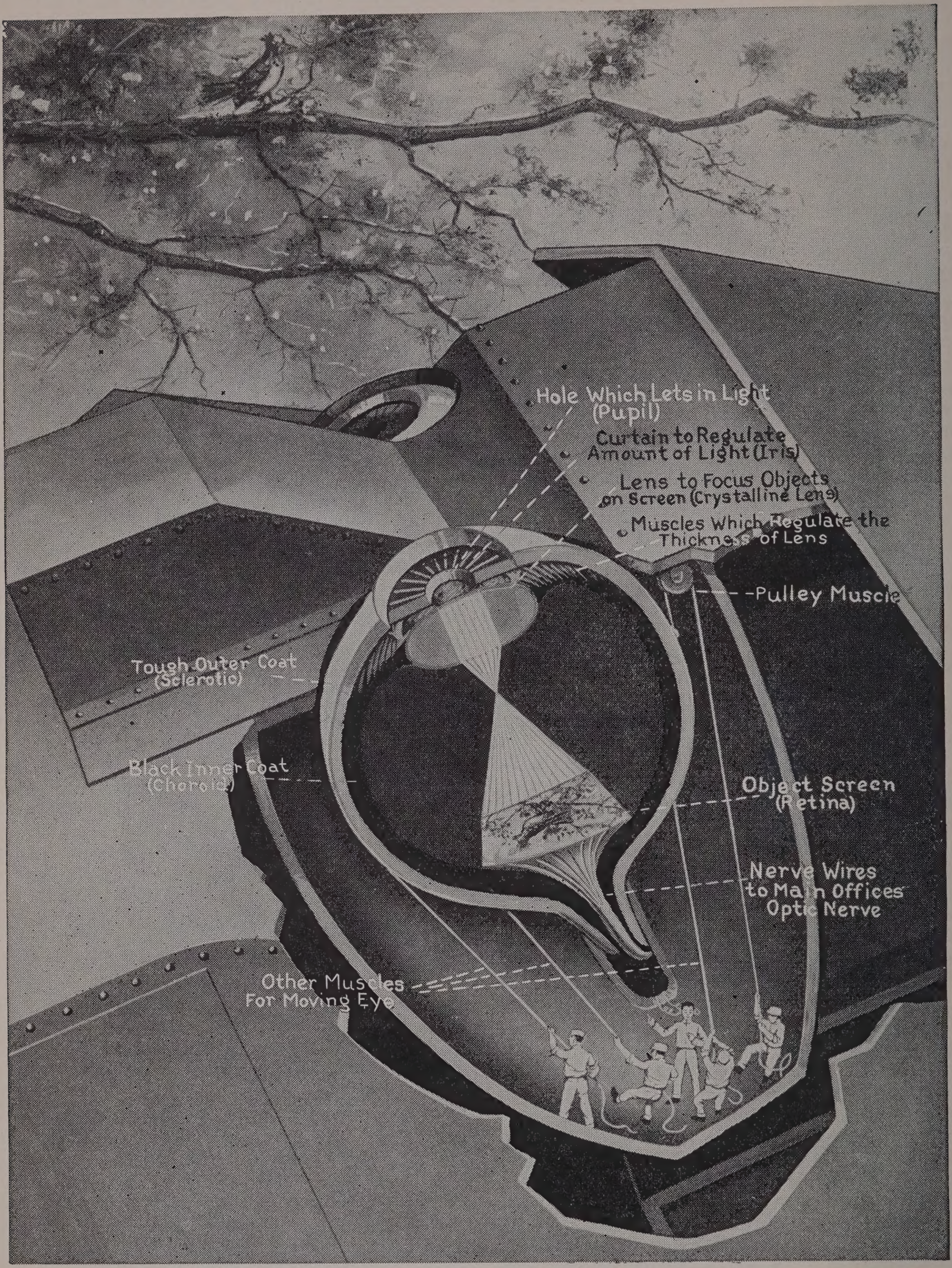
is filled with vitreous humor (see diagram); in front of that is the crystalline lens; and, still further forward, is a cavity containing aqueous humor. All of these are transparent. The sclerotic coat in front is transparent and bulges out into the cornea. The choroid coat bends down in front, as a sort of curtain, and forms the colored iris of the eye; this is perforated in front by a circular opening—the pupil of the eye. The iris has circular and also radiating muscle fibres, the contractions of which cause the pupil to vary in size according to the intensity of the light. The retina is a delicate, whitish coat of nervous material. It is very complex in structure, being composed of several sets of nervous structures arranged in layers. The outer ones are rods and cones, and the inner ones are large nerve cells. The optic nerve is made of fibers that spring from the retina and pass into the brain; it used to be supposed that the fiber of the optic nerve grew outward from the brain and spread out into the retina; it is now known that they begin their growth from nerve-cells in the retina and grow inward to the brain. The eyeball is a sort of camera with transparent lenses in front of the retina to focus light upon it. It can readily be shown that any lens, thicker in the center, will focus light on a screen in such a manner as to produce an image. If, for example, one stands by a window with a reading-glass and places a paper behind the glass at the proper distance, there will be an inverted picture of the landscape thrown on the paper by the lens. This is practically what occurs in the eye. The crystalline lens and other transparent parts in front of the retina focus light upon it and produce an inverted image; but it is the brain that does the seeing,—the eye is merely a receiving apparatus. The rays of light that strike the retina excite it to activity, and this is transmitted to the brain and brings about changes there which give rise to sight. Not all parts of the retina are equally sensitive to light. The yellow spot is the most sensitive; this lies in a line drawn directly through the center of the lens. It is a rounded, shallow depression, in which the retina is much thinner and is composed mostly of rods and cones. The remainder of the retina is sensitive to light, except the blind spot, which is the place where the fibers are gathered into the optic nerve. The rods and cones are the parts affected by the light—the fibers not at all. Therefore, in the optic nerve, which is composed entirely of these fibers, there is no activity set up by light; they are merely conductors of the effect produced on the rods and cones by the lght. The optic nerve is not connected with the eyeball symmetrically, but on the part nearer the nose, so that the blind spot is not in the center of the field of vision. The eyeball is moved by muscles—four straight ones and two oblique ones—so arranged that the eyeball may be turned up or down, to the right or left, and also slightly rotated. Certain defects in the eye are corrected by wearing glasses. When the lens is too rounding or the eyeball too long, the person is short-sighted; rays of light come to a focus before they reach the retina, and vision is hazy. This is corrected by concave glasses that tend to spread the rays of light. When the eyeball is too short, or the lens too flat, the person is long-sighted, and the rays of light come to a focus behind the retina. This is corrected by convex glasses that bring the rays of light to a focus earlier. The crystalline lens is capable of being changed to a limited degree. It is an elastic body, and is inclosed in a perfectly transparent membrane. Under ordinary conditions it is pressed upon and rendered slightly flatter than it would otherwise be; when the tension or pressure on it is reduced by the contraction of certain muscles within the eyeball, it bulges out more, and when the muscles return to their state of extension it is flattened again. The eye is accommodated in this way to clear vision for objects at different distances.

Eylau (*ī'lou*), 23 miles by rail south of Königsberg, has 3,546 inhabitants. Napoleon here encountered the allies—Russians and Prussians—under Bennigsen, Feb. 8, 1807. Darkness came on while the contest was still undecided; but, as Napoleon had a considerable force of fresh troops close at hand, the allies retired during the night upon Königsberg. Their loss was estimated at about 20,000; that of the French is set down at 10,000, but must have been much greater. The place is called Preussisch-Eylau, to distinguish it from Deutsch-Eylau, a town of 4,574 inhabitants, 89 miles northeast of Bromberg.

Eze'kiel (meaning God shall strengthen or Strength of God), one of the Hebrew prophets, was carried captive, when still a young man, along with Jehoiachin, king of Judah, to Mesopotamia by order of Nebuchadrezzar about 599 B.C. He was a member of the Jewish community which settled on the banks of the River Chebar, and first appeared as a prophet about 594, after the remarkable vision described in the opening chapters of *Ezekiel*. His career as a prophet extended over a period of 22 years. The date of his death is not recorded. *Ezekiel* was placed by the Jews among the "treasures," not to be read before the age of 30.

Ez'ra (Help), a Jewish scribe, lived about 450 B. C., and was regarded by the Jews of Christ's time as the second founder, with Nehemiah, of the Judean state. Judaism, as a religion, in distinction from the Hebrew religion before the captivity, dates from his day.

HOW THE EYE TAKES PICTURES


Hole Which Lets in Light (Pupil)
Curtain to Regulate Amount of Light (Iris)
Lens to Focus Objects on Screen (Crystalline Lens)
Muscles Which Regulate the Thickness of Lens
Pulley Muscle
Tough Outer Coat (Sclerotic)
Black Inner Coat (Choroid)
Object Screen (Retina)
Nerve Wires to Main Offices Optic Nerve
Other Muscles For Moving Eye

Compare the position of the bird with the picture of him in the camera. The rays from the bird are crossed in passing through the lens and so the image is inverted. The size of the hole, the pupil, through which the light passes, is regulated by a curtain, the iris, much as the photographer regulates the light entering his camera. Another particularly interesting thing about the eye is that muscle which is actually operated on the pulley principle, like a well rope with its wheel, although the eye arrangement is really not quite so much like a wheel as the illustration shows. And, of course, there are no little people in the eye. These busy folks simply represent the working power of the muscles. Notice that one of the workers is directing the others. This means that the eye muscles only move as they receive instructions from headquarters.

F

F (*ĕf*), the sixth letter, is a consonant. It is called a labio-dental surd, because it is made with the lips or, more commonly, with the lower lip against the upper teeth, and does not sound. It requires considerable breath to pronounce it, and gives a simple breath-sound, as in *fame*. The Spaniards and Greeks had great difficulty in pronouncing it. Its value comes from the Latin.

Fa'bius Max'imus, a member of one of the most illustrious patrician families of Rome. He was five times consul and twice censor, and was elected dictator immediately after the defeat of the Romans at Trasimenus. The tactics he observed in the second Punic War gave rise to what is now known as the Fabian policy in warfare. He avoided a direct engagement and harassed the enemy by guerilla warfare; he annoyed them by marches and counter-marches and cut off their stragglers and foragers; and during all this time his delay allowed Rome to assemble her forces in greater strength. He recovered Tarentum, one of Hannibal's strongholds. He died 203 B. C.

Factory and Factory-Legislation. It is not easy to set a date for the origin of factories. In England factories for wool were established in the reign of Edward III. But the nineteenth century was the great period of the rise of factories. This rise was the result of many new mechanical inventions, chief among which were those of Hargreave, Arkwright, Cartwright and Crompton. The factory-system of industry greatly increased the amount of production per man, but in bringing together great numbers of men, women and children it paved the way for the replacement of the old personal interest between master and workman by a mere cash-bond. Overwork and sweating became common practices. In England and America the first laws about factories dealt with the abuse of child and pauper-labor and with the lack of sanitary care within the factories, which became a fertile source of disease. The factory-system came later in America than in England. The English factories jealously guarded the secrets of their machinery. But in 1790 a factory for water-frame spinning was built in Rhode Island; and in 1803 the first cotton mill in America was built in Massachusetts. The growth of factories in America has continued with extraordinary rapidity.

The first modern factory-legislation in England was the law of Sir Robert Peel in 1802, dealing with the labor of children and paupers. A great number of acts followed, dealing with these and other problems. (See CHILD-LABOR ACTS.) In the United States, Massachusetts took the lead in labor-legislation; and the laws of the other states tend to be based on this code. But Australia and New Zealand have gone far beyond either England or America in limiting the hours of labor, the age of employees, the lowness of the wage that may be offered and the strife that is apt to occur from time to time between employers and employed, leading to wasteful strikes. But there are laws in the United States regulating the labor of women and children, sanitary matters, the soundness and safety of machinery, payment of wages, hours of labor (limited in Massachusetts to 58 hours a week for young people), hours of meals, licenses, etc.

Faed (*fād*), **Thomas,** a Scottish painter of renown, was born at Burley Mill, in Kirkcudbrightshire, Scotland, on June 8, 1826. He was made an associate of the Royal Scottish Academy in 1849, an associate of the Royal Academy in 1861, an Academician in 1864, and in 1875 was elected an honorary member of the Vienna Royal Academy. Among his celebrated pictures are *The Mitherless Bairn*, *The Last of the Clan* and *Scott and His Literary Friends at Abbotsford.*

Fahrenheit (*fä'ren-hīt*), **Gabriel Daniel,** the improver of the thermometer and barometer, was born at Dantzic, Prussia, on May 14, 1686. Originally intended for business, he abandoned trade at an early age and took up the study of natural philosophy. About 1714 he conceived the idea of using quicksilver instead of spirits of wine in the making of thermometers, thereby increasing their accuracy. Fahrenheit fixed his freezing point at 32°, to avoid errors in measuring the temperature. He was elected a fellow of the Royal Society, of London in 1724, and died on Sept. 16, 1736. For all practical purposes Fahrenheit's thermometer is the one in general use in the United States.

Fairbairn (*fâr'-bârn*), **Andrew Martin,** a notable Scottish theologian and principal of Mansfield College, Oxford, was born near Edinburgh, Scotland, on Nov. 4, 1838, and educated at the Universities of Edinburgh and Berlin and at the

Evangelical Union Theological College, Glasgow. For a time he held charges at Bathgate and Aberdeen, and from 1877 to 1886 was principal of Airedale College. In the latter year he was elected principal, on its foundation, of Mansfield College, Oxford, where his labors as a metaphysician and theologian have made him famous. He resigned in 1908. His many books, which are erudite and scholarly, have added greatly to his repute as a divine. These embrace *Studies in the Philosophy of Religion and History; The City of God; Christ in Modern Theology;* and *Religion in History and in Modern Life*

Fairbairn, Sir William, a Scottish engineer born at Kelso, Scotland, on Feb. 19, 1789. He was the first to use iron instead of wood in the shafting of cotton-mills, and was among the earliest of iron shipbuilders. Fairbairn built the tubular bridge across Mena Strait, after a plan of Robert Stephenson's. He improved upon this in the construction of the Britannia and Conway bridges, and, patenting his design, erected more than a thousand bridges upon this principle. In 1869 he was made a British baronet and a chevalier of the French Legion of Honor. He published many works and papers on iron bridges, boilers, mills. Fairbairn died at Moor Park, Surrey, England, on Aug. 18, 1874. See Smiles' *Lives of the Engineers.*

Fairbanks, Charles Warren, American statesman, born in 1852, near Unionville Centre, Ohio. His father came to Ohio from Vermont, in 1836. Mr. Fairbanks graduated from Ohio Wesleyan University, in 1872. He then studied law, and was admitted to the bar in 1874, after which he entered upon a successful legal practice in Indianapolis. In 1893 he received the support of his party for U. S. senator, but was defeated by David Turpie, the Democratic candidate. In 1893 he was delegate-at-large to the Republican national convention, and in 1897 became U. S. senator. He was appointed member of the Joint High-Commission to settle the dispute over the seal fisheries of Alaska. He was elected vice-president of the United States in 1904. He died June 4, 1918.

Fairbanks, Erastus, 1792-1864, born in Brimfield, Mass., founder, with his brother, Thaddeus, of E. & T. Fairbanks & Co., manufacturers of stoves, scales and plows. The Fairbanks family showed marked mechanical ability. The Fairbanks scale was invented by Thaddeus and perfected by later members of the family. Erastus served in the Vermont legislature and was twice governor of that state.

Fairfax *(fâr'făks)*, **Thomas, Lord,** generally known as Sir Thomas Fairfax, an English general, was born at Denton, in Yorkshire, England, on Jan. 17, 1612. He distinguished himself at the battle of Marston Moor in 1644, and in 1645 was appointed to the command of the parliamentary forces. In 1650 he refused to march against the Scots, and the command was given to Cromwell. He retired into private life, and in 1660 was appointed head of the commission sent to The Hague to arrange for the return to England of Charles II. He died at Nunappleton, Yorkshire, on Nov. 12, 1671. See his *Correspondence.*

Fairmount Park. See PHILADELPHIA.

Fair Oaks is a small place in Henrico County, Virginia, the scene of a battle fought between the Union forces under General McClellan and the Confederate army under General Johnston, on May 31 and June 1, 1862. At the end of two days' fighting the Confederates retreated, their loss being estimated at 6,500. The Union loss was 790 killed and 3,627 wounded.

Fair'y or **Elf,** an imaginary being, generally thought to be of human form but very diminutive. A belief in fairies has been among the superstitions of most European nations. Other names for them are elves, brownies, dwarfs, pixies, mermaids, sirens, banshees, kelpies and gnomes; while Puck, Mab, Oberon and Titania are well-known names of individuals among them. The belief in their wonderful powers varies in different countries, but in all they have a great deal to do with human beings and their affairs. In England the good fairies care for the home, sweeping the house, preserving the butter, while the evil ones lure people into dangerous places. The pixies in Ireland are thought to be the souls of children who have died unbaptized. The banshee is an Irish fairy or elf, watching over a special family, as the brownies do in Scotland, many a Scottish family placing a dish of milk in a convenient place for the brownie, as regularly as for the cat or the dog. The kelpie, mermaid and siren are all water-fairies; the mermaids and sirens, half-woman, half-fish, with their beauty and their song lure unsuspecting travelers to their death. During the day fairies are invisible to man; they have their homes in the clefts of rocks, in caves and in forests. It is dangerous to come upon them unawares when in their night revels, and ill-luck follows one who offends them. The literature of all countries abounds in fairy tales *Midsummer Night's Dream, Walpurgis Night,* Hans Andersen's Danish *Stories* and the Grimm brothers' popular German ones are examples well-known. See Keightley's *Fairy Mythology.*

Faith'full, Emily, was born at Headley Rectory, Surrey, England in 1835, and devoted her life to the improvement of the condition of working-women. In 1860 she founded a printing-house in London, where women only were employed as compositors. In 1863 she founded the *Victoria Magazine,* for the purpose of setting forth the claims of women to remunerative employment. Queen Victoria recognized Miss Faithfull's work by appointing her her publisher, and she was awarded a pension of $250. She died at Manchester, England, on May 31, 1895.

PEREGRINE FALCON

GERFALCON

Falcon (*fa'k'n*), the name given to a number of diurnal birds of prey closely related to the hawks, properly applied to those belonging to the genus *Falco*. Birds of great courage and power of flight, with a hooked bill bearing a notch on the upper part and sharp claws adapted for grasping, falcons live in nearly all countries of the world, and there are many varieties. The peregrine or duck-hawk is the type of the family. It occurs both in Europe and America. The body is about eighteen inches long and the spread of wings about three and one half feet. It is dark bluish-ash above, with cross-bands of brownish black, creamy white below, with spots and bars of black. The throat is white, and there is a black spot on the cheeks under the eye. The eyes are brown. The birds rise in spirals above their prey and strike them from above, the shock of the blow and the sharp talons usually killing the prey at once. Besides water-fowl, they attack pigeons, snipe and other birds. They nest usually on rocky ledges. The gerfalcon is the largest and finest of the falcons. It is found in the northern parts of Europe and America, as also in Iceland and Greenland. The American form resembles the peregrine in color, but the Greenland form has white plumage with dark bars. Both the peregrine and the gerfalcon fly with astonishing rapidity; it has been estimated that they fly at times one hundred and fifty miles an hour. The pigeon-hawk is found throughout the United States. Although smaller than the duck-hawk, it is bold and fearless and kills birds larger than itself. It is like the European merlin. The common sparrow-hawk of the United States belongs also to the group of falcons. It corresponds to the very common British kestrel. It will nest in deserted woodpecker-holes or in martin-boxes. It feeds mainly on field-mice, insects and, occasionally, a small bird. The falcons are interesting from the circumstance that they were long used in the chase of smaller game. Long before the Christian era these birds were employed in this way, and falconry was a common field-sport for the nobles in Europe for many centuries. It was introduced into England about the ninth century. The birds were trained for taking a particular kind of game, including all kinds of birds,—even those as large as herons,—hares, rabbits, etc. They were carried out perched on the arm or glove of the hunter, frequently with a small leathern hood over the eyes, which was removed just before releasing the bird. Two kinds of falcons were recognized: noble hawks, with long wings that fly high above their prey and stoop to strike it from above, and ignoble hawks with short wings, that fly low and chase after their prey. The noble hawks, like the peregrine and gerfalcon, have dark brown eyes, the ignoble ones light yellow eyes. Falconry is still practiced in eastern countries and, though rarely, on some large estates in England.

DR. R. A. FALCONER

Falconer (*fa'k'n-ĕr*), **Dr. R. A.**, president of the University of Toronto, was born in Nova Scotia. He was selected for this position out of eighty men under consideration by the governors. He was educated at Queens Royal College, Trinidad. While studying at Trinidad, he passed the Cambridge local examination with firstclass honors. He also passed the London matriculation, winning the Gilchrist scholarship. Later he took his M. A. with honors at Edinburgh. He studied for some time in Germany. Returning to Nova Scotia in 1892, he was appointed lecturer in exegetics in the Presbyterian College, Halifax, becoming professor in 1895, and later was appointed principal of the college. His work there was most successful. As an indication of his breadth of view it may be said that he was given the degree of LL. D. by St. Francis Xavier's College in 1905. In his new and wider field of work every indication points to a successful career, perhaps the premier educational position in Canada

Falkland Islands (*fạk'land*), a cluster of islands in the south Atlantic, some 250 miles east of Patagonia. The group consists of East and West Falkland, with an area of 6,500 square miles, and about 100 small islands. Some of the islands are filled with myriads of penguins, and the governor has been called the king of the Penguins. The population in 1911 was 2,272. The climate is healthful, and resembles the Orkneys, off Scotland. There are no trees on the islands, neither is coal found there, but peat is plentiful. The chief industry is sheep-raising. The islands were first sighted by Davis in 1592 and received their present name in 1689 from Captain Strong in honor of Lord Falkland, his friend. The chief town is Port Stanley. Since 1833 the islands have belonged to Great Britain.

Fall River, a city of Massachusetts, 49 miles south of Boston, noted as a great cotton-manufacturing center. It contains nearly 42 cotton mills, and more cotton goods are made here than at any other point in America. A very important industry is the dyeing and finishing of textiles, and others are foundry and machine-shop products, etc. It has fine public schools, with a teaching force of 500 and an attendance of 25,100 pupils. The city has a free public library of about 150,000 volumes. The population has been increasing rapidly, and is now about 135,000.

Fallieres, Clement Armand, French politician and legislator, born at Mezin in the Department of Lat-et-Garonne in 1841. He now is president of France, having been elected to that office on January 17th, 1906. At 30 he was elected mayor of Nérac, and in 1876 he became a representative in the national chamber of deputies. He was a member of many of the cabinets from 1880 to 1892. He was elected to the senate in 1890 and subsequently acted as president of that body.

Falls of Montmorenci. See Quebec.

Faneuil Hall. See Boston.

Faraday (*făr'ȧ-dā̆*), **Michael**, the leading physicist of the English-speaking races during the first half of the 19th century, was born in the suburbs of London on Sept. 22, 1791, and died at Hampton Court on Aug. 25, 1867. At 14 he was apprenticed to a bookbinder, and there managed to educate himself largely from the books which were brought in for binding. Having attracted the attention of Sir Humphry Davy by a set of notes which he had prepared on some lectures heard at the Royal Institution, he received an appointment as assistant in chemistry at the Royal Institution. This was the beginning of that remarkable scientific career which led Sir Humphry Davy in his later years to reply to the query: "What do you consider the greatest scientific discovery you have ever made?" "Michael Faraday." Among Faraday's principal achievements may be mentioned: The discovery of the laws of electromagnetic induction. (See Electricity); of those of electrostatic induction; and of those of electrolysis. (See Electrolysis); of the properties of paramagnetic and diamagnetic bodies; and of a connection between light and electricity, viz., the electromagnetic rotation of polarized light.

Every student should read his *Experimental Researches in Electricity*. His papers on electrolysis have been edited and reprinted by Professor Goodwin in Harper's *Scientific Memoirs*.

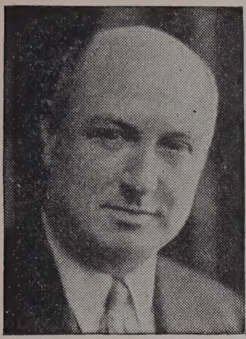
Faraday was a man of the highest character and beloved by every one who knew him. Many learned societies at home and abroad sought to honor themselves by honoring him. There is a true sense in which Faraday's work was completed by Maxwell, who clothed Faraday's ideas in mathematics, and by Hertz who showed by experiment (1888) that Maxwell's mathematical inferences were correct.

Fargo, a city of North Dakota, the county-seat of Cass County, opposite Moorehead, Minn., situated on the Red River, 254 miles west of Duluth. It is an important commercial and railroad center, having six banks and numerous other public institutions. The region about is a great wheat district, equipped with the latest and most approved farm machinery, and makes Fargo one of the great distributing centers of the U. S. for farm-equipment, as well as a manufacturing point of many articles used in farmwork. Besides a United States land-office, Fargo has the North Dakota Agricultural College, Experiment Station, a Congregational college, a Roman Catholic academy and a number of fine churches and public schools, a handsomely equipped High School, offering manual training as well as several courses. It was a small village in 1874, but now is the largest city in the state. Population 25,000

Farinelli (*fä'rē̆-nĕl'ē̆*), **Carlo**, was one of the best singers of the 18th century. He was born at Naples or at Andria, on Jan. 24, 1705. He sang before nearly all of the European monarchs of his time, and through his voice gained wonderful power over Philip V of Spain, which gave him almost the place of a prime-minister. He died at Bologna on July 15, 1782.

Farjeon (*fär'jŭn*), **B. L.**, English novelist, was born at London, of Jewish parentage, in 1833. He spent his early journalistic and literary life in New Zealand; he married in 1877 the daughter of Joseph Jefferson, the American comedian; and for a time he employed himself as a playwright. His first story to attract attention was *Grif*, which appeared in 1870, and dealt with Australian life. This was followed by a number of tales of strong sensational interest, as *Blade-o'-Grass, Bread and Cheese and Kisses,* and *The Betrayal of John Fordham.* He died on August 1, 1903.

Farley, James A., an American statesman, was born at Grassy Point, Rockland County, New York, on May 30, 1888. He was educated in the public schools and at the Packard Commercial School in New York City. He became interested in politics at an early age, and built a political organization in Rockland County which was modelled on Tammany. He was appointed port warden of New York City in 1918, for the year ending in 1919, which also marked the end of seven years' service as town clerk of Stony Point. He was married in 1919, and has three children—Elizabeth, Ann, and James, Jr. He held various county offices from 1919 to 1923. With his political interests, he has also been a successful business man, in salesmanship first, and in recent years in the building materials supply business in New York City. In 1924 he was made a member of the State Athletic Commission by Alfred E. Smith, then Governor of New York. He was a delegate to the Democratic National Conventions in 1924 and 1928, supporting Alfred E. Smith. Prior to the Democratic National Convention of 1932, Farley set out to secure the nomination for the presidency for Franklin D. Roosevelt. He was given charge of the campaign, and made chairman of the Democratic National Committee, in July, 1932. He had been chairman of the Democratic State Committee for New York since 1930. These services secured for him the Cabinet office of Postmaster General, in which capacity he not only oversees the postal service of the nation, but also gave his approval to the applicants for the more than 100,000 Government jobs formerly held by Republicans, and awarded to Democrats upon the new administration taking office.


James A. Farley
Postmaster-General

James A. Farley is the giant of the Cabinet, called "Big Jim" by his associates. He is a man of straightforward speech, unbiased in his judgment of men. He has an excellent memory and is said to be acquainted with more people in politics than any other man in the country. He is a man of strong friendships, and liked by everyone who knows him. His engaging personality is his greatest asset.

Farley, John M., archbishop and Roman Catholic metropolitan of New York, was born in 1842 at Newton Hamilton, Ireland, and came as a youth to America. He studied for the priesthood at Fordham and at Troy, New York. He was ordained in 1870 at Rome. Archbishop Farley held many special and responsible positions, and for some time was rector of St. Gabriel's Church, New York. In 1902 his name was unanimously suggested by the diocesan rectors, provincial bishops and American archbishops for the vacant see of New York; and he received his pallium in 1903, from Pius X. Archbishop Farley was a force in the conversion of thousands of immigrants into good citizens. He died in 1918. He was the author of the *Life of Cardinal McCloskey* (1900).

Färoe (*fâ'rō* or *fā'rō*) **Islands**, a group of twenty-two islands belonging to Denmark, are situated midway between the Shetlands and Iceland. They extend over an area of 540 square miles. Toward the sea the islands are rugged cliffs, rising from 1,000 to 2,300 feet high, while in the inland portions they become flat-topped mountains, 3,000 feet in height. Seventeen of the islands are inhabited. The largest is Strömöe, twenty-seven miles long and eight miles wide. The capital, Thorshavn, is situated on this island. There are no trees on the islands, but timber is imported from Norway. Sheep farming and fishing are the chief industries. Coal and peat abound on the islands, and there are many wild fowl. Exports are chiefly tallow, train oil, feathers, skins, wool, fish and butter. The making of coarse woolen goods is the only manufacture of its kind. The people are of Norse descent and speak the old Norse dialect, slightly modified. The islands were held by Norway until the fourteenth century, when they were shared with Denmark, which country became the sole owner in 1814. Recently, a Nationalist movement has gained strength, and anti-Danish demonstrations have been held in Thorshavn. A resolution demanding independence was introduced into the local Parliament, the *Lagthing.* The population of the Faroe Islands, according to the census of 1930, is 24,200; the population of Thorshavn, the capital, is 2,895.

Farragut (*făr'ȧ-gŭt*), **David Glasgow.** The ranks of vice-admiral, rear-admiral and admiral of the United States Navy were created successively to reward the services and acknowledge the genius of this greatest of American naval heroes. The operations which resulted in the capture of New Orleans and Mobile are comparable only to those of Nelson at Copenhagen, the Nile and Trafalgar. The difficulties to be overcome were infinitely greater, and the operations extended over a longer period of time. The exploits of Dewey at Manila and of Togo in the Japan Sea were accomplished under such different conditions, due to modern inventions, as to place them in a class apart from sea-fighters of even a generation ago.

David G. Farragut

Farragut was born on July 5, 1801, in a

pioneer cabin near Knoxville, Tennessee, of a father of Spanish descent and a Scotch mother. Owing to his father's friendship with Commodore Porter the boy was shipped on the frigate *Essex* before his tenth birthday. The American naval academy was not established until 1845, so cadets were educated and trained at sea. When only twelve, Midshipman Farragut took a prize-ship (War of 1812) into Santiago, Chile, and acted as powder-boy in the battle of Valparaiso. Forty-five years of routine duty followed, on cruisers, on training ships, testing ordnance in the department at Washington and in charge of the work of establishing the naval station at Mare Island, San Francisco. When the Civil War began he was in his sixtieth year. Of southern birth, with a Virginia wife and home, he decided that his fealty belonged to the nation. In February, 1862, with the rank of admiral he was given a fleet of forty-eight vessels, of 200 guns, the largest ever fitted out by the United States up to that time, and ordered to take New Orleans and clear the Mississippi of Confederate forts and gunboats.

Not one of his ships was an ironclad; some were propelled by steam, others were sailers; all had been built for sea-service. With these he had to operate in a narrow, shifting river-channel, pass two forts, break through chains connecting anchored barges, turn aside blazing fire-boats, risk torpedoes, sink the fleet of the enemy above all these obstructions and reduce the city. He accomplished the task in three months' time with a loss of only thirty-seven men and one vessel. For sixteen months there after he was so continuously under fire as he moved up the river, and so invariably the victor, that he won the nickname of Old Salamander. In January, 1864, he captured Mobile in one of the most brilliant engagements of naval history. When the dead were laid out on the deck of the flagship, he wept like a child.

Farragut was such a master of detail that he could have taken the place and done the work of any man in his fleet. Honest, upright, religious, of tender sympathies, he inspired respect, enthusiasm and personal affection. The war wrecked his health, so that he died in Portsmouth, New Hampshire, on August 14, 1870. Congress purchased Virginia Ream's statue of him for Farragut Square, Washington, and New York City has one of Augustus St. Gaudens. Holmes pays tribute to him as:

"The Viking of the River Fight,
The Conqueror of the Bay."

Farrar, Frederick William, English clergyman and dean of Canterbury, was born in Bombay, India, on August 7, 1831. He was educated at King William's College, at the University of London, and Trinity College, Cambridge, from which he was graduated in 1854. He was ordained deacon in that year and priest in 1857. He was assistant master at Harrow from 1855 to 1870, and head master at Marlborough College from 1871 to 1876. In 1876 he was appointed rector of St. Margaret's and a canon of Westminster Abbey. He became chaplain of the House of Commons in 1890, and dean of Canterbury in 1895. He became famous for his brilliant preaching, and so universal was the high esteem of his work that he was appointed queen's chaplain in 1873. He was often university preacher at both Oxford and Cambridge. He visited the United States in 1885. Dean Farrar died in 1903. Among his many literary works are: *Hulsean Lectures* (1870); *Life of Christ* (1874); *Life of St. Paul* (1879); *The Early Days of Christianity* (1882); *Eternal Hope* (1878); *Darkness and Dawn; The Bible: Its Meaning and Supremacy* (1897), and *The Life of Lives* (1899).

Fascism (*făsh'ĭzm*), a political movement in Italy, was founded on March 23, 1919, as the *Fascio di Combattimento* at Milan. Benito Mussolini, at that time editor of *Il Popolo d'Italia,* was the leader in this movement. The first *Fascio* was composed of about 150 of his friends who had supported him in the early days of the World War, when he withdrew from the Socialist party and resigned the editorship of *Avanti* to encourage Italian participation in the War. The name of the organization is derived from *fasci,* Italian version of the Latin *fasces,* a bundle of rods bound together and used by the ancient Roman lictors to symbolize authority and law. The modern Italians use it to designate the close union of the members.

Many of the early ideas of Fascism originated in the national movement of 1910 and in Syndicalism. Only a few were attracted to the party in the beginning, and those because of its opposition to Bolshevism and Socialism. In the first month of their existence, the Fascisti burned the *Avanti,* Socialist daily; and in 1920 they suppressed Red riots. A deep patriotism was a keynote of the movement, evidencing itself in a sense of the importance of Italian foreign affairs. During the early years of the organization, the Fascisti spread propaganda in support of Italy's claims to the Tyrol, Fiume, Dalmatia and Albania.

During 1919 and 1920, the idea of Fascism spread rapidly throughout Italy, although the organization itself as such took a small part in the affairs. Late in 1920, the Fascisti collaborated with other anti-Socialist groups and brought about the downfall of the "Red" organizations. After this success, Fascism became a mass movement, joined by workmen and landholders, even by whole unions.

The Fascisti early won the title of "Black Shirts," which they wore to distinguish themselves as members of the organization. By the middle of 1922 they numbered more than 500,000, drilled and armed under the command of Mussolini. They gained control of many cities and towns before they marched to Rome and occupied the city. The cabinet of Luigi Facti, the premier, resigned. King Victor Emmanuel III asked Mussolini to form a government, and he presented a list of new Cabinet members with himself as Premier. This government was inaugurated on October 30, 1922, at which date Mussolini became virtual dictator of Italy.

The Fascist program was built on the idea of the maintenance of the prestige of the State, functioning as a legal and political unit, to realize the interests of the nation. Trade unions have been encouraged to develop production. The State is entitled to take disciplinary measures over class conflicts, and strikes are not to be tolerated. National finances must be stabilized. The Labour Charter of April 21, 1927, announced the labour policies of Fascism, which recognizes the importance of capital, yet subordinates the individual to the interests of the nation. Work is proclaimed as a social duty, and private initiative is held as the "most effective instrument of production." Workers are considered active partners, although the control of the enterprise rests with the employer. The Fascist Grand Council directs party activities through the Cabinet.

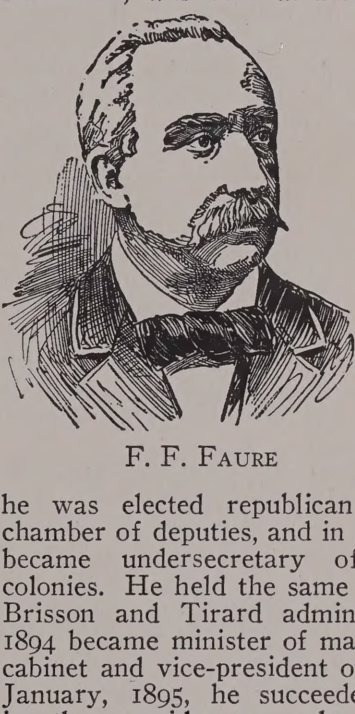
There are thirteen national Fascist organizations. The entire Fascist party proper numbered on June 24, 1932, 1,329,693 members, which marked an increase of 181,933 during the year. In 1933, there were admitted 200,000 new members out of 600,000 applicants. The Fascist children's organization numbered in 1931: *Balilla* (boys from eight years to fourteen) 835,801; *Avanguardista* (boys from fourteen to eighteen) 277,401; *Piccole Italiane* (girls from eight to thirteen) 661,778; *Giovani Italiane* (girls from thirteen to eighteen) 80,000; and, in addition, 270,000 members, both boys and girls from six to eight years old. The Fascist militia numbers 23,326 officers; 252,902 rifles; and 16,313 revolvers. General Bazan is in command, and Mussolini announced as early as 1928 that in case of war the militia would be incorporated as an independent unit in the regular army.

See Austria; Germany; Great Britain; Hitler, Adolf; Italy; Japan; Mussolini, Benito; Russia.

Fashoda (*fä-shō'dä*), now **Kodok**, a town of Anglo-Egyptian Sudan, upon the White Nile, was the center of a serious dispute in 1898 between England and France. It had been occupied by a French expedition under Captain Marchand; but the British, fresh from their victory at Omdurman, claimed the town for Egypt. In the end Fashoda was evacuated by the French, who in return received an extension of their possessions in Central Sudan. The population is about 3,000.

Fast, doing without food for any cause, but usually as a religious ceremony. Its origin is doubtful, but by degrees it became a religious observance, and is recognized by the Roman Catholic church as a church-law of discipline. The Mosaic law set aside one day yearly for the purpose of fasting, the tenth day of the seventh month, called Yom Kippur or Day of Atonement. In course of time five more fast-days were added in memory of days of humiliation and national misfortune. Many new ones have since been added; but among the orthodox Jews few of them observe any but those of Yom Kippur and the five mentioned. Fasting in the Greek church is observed with great austerity. The principal fasts are Wednesday and Friday; Easter, forty-eight days; Christmas, thirty-nine days; that in honor of the Virgin fourteen days; and that of the Apostles extends from the first Monday after Trinity to the twenty-ninth day of June. The Church of England and the Episcopal church of the United States recognize fasting as praiseworthy, but do not command it.

Fates, a term in Greek mythology used to represent the three daughters of Night: Clotho, the spinner of the thread of life; Lachesis, who determines the length of the thread or the lot of life; and Atropos, or the inevitable, who cuts the thread. They were represented sometimes as young women, sometimes as matrons. They had places consecrated to them at Sparta, Corinth, Thebes and Olympia.



F. F. Faure

Faure (*fōr*), **François Félix**, a French statesman, was born at Paris on January 30, 1841. He was originally a currier; but he became a merchant and shipowner at Havre and an authority on shipping, commercial and colonial questions. He took part in the Franco-Prussian War, and was decorated for services in Paris in suppressing the rising during the Commune. In 1881 he was elected republican member of the chamber of deputies, and in Gambetta's cabinet became undersecretary of state for the colonies. He held the same post in the Ferry, Brisson and Tirard administrations, and in 1894 became minister of marine in the Dupuy cabinet and vice-president of the chamber. In January, 1895, he succeeded Casimir-Perier in the presidency, and during his term (1895-99) was exceedingly popular. He died in Paris on February 16, 1899. He received a prize from the French Academy for his *Les budgets contemporains* (1887).

Faust (*foust*), **Dr. Johann**, was a famous magician and dealer in the black art, who lived in the sixteenth century. He has been made a central character in literature, and became the hero of Goethe's *Faust*. Luther spoke of him as the type of "the infidel and impious man." The story is that he obtained his art from Satan, making a contract that the devil should serve him for twenty-four years and at the end of

that time should have possession of his soul. The contract was signed with his own blood. Marlowe and Goethe both made the story the subject of a drama. He is said to have died in 1538.

Faust or **Fust, Johann,** a German printer, born in Mentz, Germany, who was associated with Gutenberg in the first introduction of printing. He probably had nothing to do with the invention of printing, but furnished the capital to introduce the new art. The process was kept secret at first, but at the sacking of Mentz, in 1462, Faust's workmen were scattered and the new art became public property. A Latin Bible in the Mazarin library is thought to have been printed by Faust. The probable date of his death, at Paris, is 1467.

Favenc (*făv'en*), **Ernest,** explorer and author, was born in London in 1846 and educated at Berlin and Oxford. From 1865 to 1879 he was a pioneer in Queensland, in 1878 taking charge of the Queenslander expedition from Blackhall to Port Darwin, and he has since been on several minor expeditions in the northern territory and in western Australia. His published works include *The History of Australian Exploration*, *The Secret of the Australian Desert*, several books of fiction and many scientific pamphlets. Since 1888 Mr. Favenc has engaged in journalism

Faw'cett, Edgar, American man-of-letters, was of English extraction, and was born in New York May 26, 1847, and educated at Columbia College. He began his literary career by publishing some collections of sensuous verse, followed by novels and essays. Of the latter, the better known are *A Gentleman of Leisure*, *Miriam Balestier* and *A Demoralizing Marriage*. Besides fiction and verse he has written plays and *Agnosticism and Other Essays*. Fawcett died on May 1, 1904.

Faw'cett, Henry, an English statesman, was born at Salisbury, England, in 1833. After graduating at Cambridge he studied law, intending, as he said when a boy, to enter Parliament and to work for all who were "desolate and oppressed." His hopes seemed suddenly blasted, when, while out shooting with his father, the contents of his father's gun entered both eyes, blinding him completely. But, with rare courage, he determined to accomplish, though blind, whatever he had planned to do when he had his sight. He entered Parliament in 1865, where he carried out his early plans of working for the oppressed in many reform-measures for factory children, for the native population of India, for the common people in keeping open spaces, such as Epping Forest and the New Forest, for their benefit. He became postmaster-general in 1880, and within a fortnight had inaugurated five reforms: the parcel-post, postal orders, a postal savings-bank, postal life-insurance and cheap telegrams. He instituted an annual week's holiday for country-postmen and encouraged the employment of women. He died on Nov. 6, 1884. A national memorial has been erected to him in Westminster Abbey. See Leslie Stephen's *Life of Henry Fawcett.* His wife was a distinguished political economist and publicist.

Fawkes, Guy, a conspirator, born in 1570, concerned in the Gunpowder plot, for which he was hanged on Jan. 31, 1606. See GUNPOWDER PLOT.

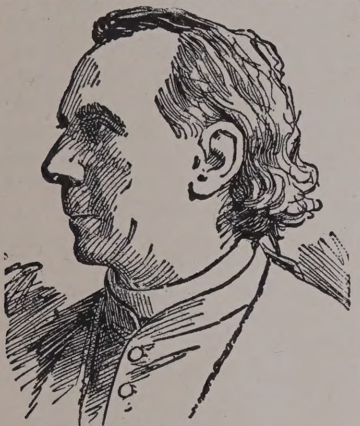
Feast. See FESTIVAL.

Feathers. No animals but birds possess feathers; they are outgrowths from the surface-layer of cells and correspond to the scales of fishes and the hairs of other animals. They are usually arranged in definite tracts with smooth spots between them. A complete feather is composed of a lower hollow stem or quill, which passes into a four-sided shaft filled with pith. From the shaft barbs spring right and left and carry smaller projections called barbules, which interlock by means of little hooks giving firmness to the vane of the feather. When the barbs are fine, the feathers are soft and downy. Feathers are of two kinds: the contour-feathers that give form to the bird and are compact, and the down-feathers distributed among them. Feathers are formed from a papilla or little knob of cells, that become inclosed in a pocket of the skin, called a follicle. The papilla is richly provided with blood-vessels, and is the germ from which the feather grows. A sort of mold for the outlining of the feather is produced within the follicle, and as it grows it is pushed from the follicle and dries in the air. The quill is inserted into the mouth of the follicle. Moulting or shedding of the feathers occurs annually, usually in the fall. In addition, there is frequently, in the spring, a partial shedding of the smaller feathers. The colors of feathers are due to minute granules of coloring-matter or pigment. Feathers are extensively used in millinery and for stuffing pillows; the quills are used for pens, toothpicks, holding hairs for artists' brushes, etc.

Federal Trade Commission, a board of 5 members, appointed by the president, no more than 3 of whom can be of the same political party. It was organized first in 1915, and has power to investigate and restrain unfair methods of competition and violations of the anti-trust law. Its orders are enforced by the United States Circuit Court of Appeals.

Feeding-Stuffs for stock are commonly classed as concentrates and roughage The former are those with a narrow nutritive ratio, as grains (see BALANCED RATION); the latter are the coarse forages with much fiber or water. Roughage may be dry forage, as cured timothy, clover, alfalfa, etc.; or green forage. The latter may be fed in pasture somewhat before reaching maturity, or cut and fed green, then known as soiling-crops; or cut and stored in a silo, to remain juicy for winter feeding with dry feed, the material so stored being known as ensilage (q.v.). Animals in pasture need less of concentrated food than those on dry forage; but more can be fed from the same number of acres by giving the soiling-crops to stock under cover. Forage crops include corn, clover, alfalfa, cowpeas, rape, oats and millet. Sometimes more than one are sown together, as oats, peas and rape for hogs, or rape with wheat for pasturage after harvest. If the change from dry forage to green pasturage be too sudden, stock is liable to the trouble known as bloat, due to rapid fermentation of the food. See Henry's *Feeds and Feeding*, Jordan's *Feeding of Animals* and bulletins of Experimental Stations and the U. S. Dept. of Agriculture.

Feehan, Archbishop Patrick A., an American Roman Catholic prelate, was born in County Tipperary, Ireland on Aug. 29, 1829, and educated at Castle Knock and Maynooth Colleges. Emigrating to the United States in 1852, he became pastor of a church at St. Louis and president of a church seminary at Carondelet. In 1865 he was consecrated bishop of Nashyille, Tenn., and in 1880, when Chicago was made an archiepiscopal see, Bishop Feehan became its first archbishop. He died on July 12, 1902.



ARCHBISHOP FEEHAN

Feeling. This term is ambiguous, as it may refer to sensations of touch or to the general subjective sense of the pleasantness or unpleasantness of experience. It is in the latter meaning that the word is here used. Feeling is commonly contrasted with cognition, the latter giving the objective qualities of things, *i. e.*, their color, shape, size, causal relations, etc.; the former, the way in which they affect us. Traditional psychology has commonly distinguished between cognition, feeling and volition, as distinct powers or faculties of the mind; but to-day the tendency is to regard all consciousness as involving activity (see Child Study). Volition therefore is only a type of cognition. When attention is concentrated on a certain act, and one feels willing to do this act and is moreover aware of consent to its performance, the mental state is one of will. It follows that consciousness has two fundamental phases, cognition and feeling, both of which have an important bearing on action. When consciousness involves relatively much feeling and little thought, impulsive, uncontrolled action follows; when the cognitive element increases in proportion, the activity comes under guidance, becomes voluntary. In any case the amount of feeling is a fair indication of the dynamic force of a state of consciousness.

The relation between feeling and cognition has been an interesting question in the history of psychology. Plato assumed that feeling is of two kinds: one dependent on bodily conditions, as the appetite, physical pleasure and pain; the other dependent on ideas, as social, aesthetic and moral feelings The former is base, the latter noble. This view is a common one and is retained by Herbart, who reserves the word *feeling* for the latter class and calls the former emotion; a terminology not preserved by modern psychology. According to Herbart education should strive to control or suppress the emotions, but the feelings should be encouraged, for from them springs interest (q. v.), the dynamic force of learning. Modern psychology finds no essential difference between physical and intellectual feelings, and ascribes to both the same general function in the life of the organism.

Three fundamental problems are involved in the recent psychology of feeling. The first concerns the classes of feeling, the second its conditions and the third its function. As regards classification all distinctions based on the nature of the object that rouses the feeling rather than upon its subjective effect are set aside. Social, ethical, aesthetic, sensuous and intellectual feelings are no longer thought to be distinct varieties. Wundt, the German psychologist, offers the most elaborate classification of pure feeling. He says that we may be affected in six ways, pleasantly or unpleasantly, with excitement or depression, or with strain or relaxation. Other psychologists reject all but the first two, claiming that excitement and depression, strain and relaxation are distinguishable only by means of the kind of sensations involved and are not classes of pure feeling. For instance, strain, they claim, tells us that our muscles are moving with difficulty and not how this motion affects us. It may be either pleasant or unpleasant.

As regards the conditions of feeling we again have much discussion and no certain agreement. It is generally recognized that sensations of ordinary intensity are usually agreeable, whereas those that are either very feeble or very intense are usually disagreeable. Professor Angell adds two other conditions which seem accurately stated and suggestive. He says that whenever the bodily tone is good, normal experience is pleasant, but the same experience may be very unpleasant to one who is tired or sick. Again, whatever interferes with our purposes, as the failure to recall a name that we wish to use, the inability to see any suggestion looking toward the solution of the problem at which we are working, the recognition that we have omitted an indispensable step in some work that we are carrying on, are all disagreeable. On the other hand, whatever furthers the purposes of the mind is pleasant.

It will be seen that on this basis disagreeable feelings are the spur that incites us to intenser activity in readjusting ourselves to conditions that at present are unsatisfactory, while agreeable feelings encourage this activity when it is successful or seems likely to prove so. Feeling is the stimulating and relative agency in mental life. It is not so much a result of experience as a judgment on its significance and value.

A similar explanation can be given of the function of the emotions. These are very complex mental conditions in which some exciting object, *e. g.*, a dangerous beast, occupies the focus of attention, but the background of consciousness is made up of a mass of organic sensations arising from the general bodily disturbance that constitute reflex reactions to the terrifying object. These organic disturbances consist in changes in the heart-beat, in the circulation and in the activities of the digestive and secretive organs, as well as vigorous expressions of the outer muscles. The emotions are usually toned with very intense feeling. So important are the organic sensations that Professors James and Lange have declared that without them there is no emotion, but merely an indifferent intellectual apprehension of the exciting object. So far, therefore, as we can stimulate or suppress emotional expressions, we can excite or allay the corresponding emotions. This offers a valuable suggestion to the teacher concerning the importance of encouraging the expression of desirable emotions and discouraging that of others.

The organic and external expressions of emotion may both be regarded as instinctive. In many cases their utility is obvious, as in that of flight because of fear or striking from anger. In other cases, although no longer useful, they may have served our ancestors. The paralysis of fear, harmful to us, causes the lower animals to lie quiet and thus escape the observation of their enemies. A still more significant function of emotional excitement is brought out by Professor Dewey, who points out that the violent internal disturbances that cause emotions constitute the condition for an immense amount of experimental activity through which eventually the unusual situation that excites the emotion may be satisfactorily dealt with. Emotion like feeling is thus seen to be a spur to readjustment, and frequently a desirable aid to education. See CHILD STUDY, ADOLESCENCE, INTEREST. Consult James's *Principles of Psychology*, Holt & Co.; Angell's *Psychology*, Holt & Co.; and Ribot's *Psychology of the Emotions*, Scribners.

E. N. HENDERSON.

Feldspar or **Felspar,** a class of minerals always found in granite rocks and, when decomposed, forming clay. It is what is known as a rock-forming mineral, that is, it is one of the substances that crystallize when lavas solidify into firm rocks or when rock-masses become crystalline from heat and pressure. Feldspars always contain silica and alumina, while the other constituent or constituents vary. There are several varieties, known as soda-feldspar, lime-feldspar, potash-feldspar, etc., according to the composition. In granite the color is given by feldspar, and so we have gray, red or pink granites. Some varieties are used in jewelry, because of their hardness, which admits of a beautiful polish, and of their bright colors. Labradorite, so named because found by Moravian missionaries on the coast of Labrador, is one of the most beautiful kinds used for this purpose; so are a variety which is cut into stones known as moonstone and the Amazon stone, a bright green in color, found at Pike's Peak, Col. Of the clay-formed feldspar-rocks, those which have the most feldspar make the finest clays, such as kaolin, and are much used in porcelain-manufacture.

Felix, Antonius or **Claudius,** a Roman governor of Judæa in the time of the Apostle Paul. His wife was Drusilla, according to Tacitus, a daughter of Antony and Cleopatra. He was an energetic ruler, clearing the country of the robber-bands that abounded and holding the seditious Jews in check. When Paul was brought before him as a prisoner, and he heard him "concerning the faith in Christ," he trembled and said: "Go thy way for this time. When I have a convenient season, I will call for thee." When he was recalled in 62 A. D. to Rome, he left Paul in prison to please the Jews.

Fellah (*fĕl'ȧ*), an Arabic word, meaning tiller of the soil. Fellahin are the descendants of the ancient Egyptians, intermingled with Syrians and Arabs. The men are of middle stature, large skull and oval face, thick lips and small hands and feet. The women are slender and graceful, and often of beautiful features. They marry at eleven, become mothers at twelve, and grandmothers at twenty-four. Their food consists almost entirely of vegetables, and their drink is Nile water and coffee. They exhibit the moral qualities of the ancient Egyptians and inherit their traditional hatred against the paying of taxes. See A. B. Edwards' *Fellah and Fellahin.*

Fellowship (*College*), an honor granted by a university to a graduate who shows promise of high attainment, accompanied by an annual stipend. The fellow or recipient of the fellowship is expected to pursue advanced studies in some chosen department of the university. In America these studies usually are along the line of advancement to a higher academic degree. In some instances the fellow is expected to perform some service to the university, as giving a certain amount of instruction, in return for his fellowship. Sometimes traveling-fellowships are given, in which case the fellow has the privilege of using his stipend to visit other universities and pursue his work there instead of at the university granting the fellowship. The income from a fellowship varies from $120 *per annum* to $1,000 and over, the usual value being $500. The custom of giving fellowships is an old one in several European universities, but of recent origin in the United States. In Oxford University, England, a fellowship used to be granted for life, forfeitable, however, in case of marriage or of attainment to a position in the church or upon admission to the bar. In Cambridge University, England, fellowships are now held for six years. In America they are granted only for one year, but often may be renewed for one or two years more.

Felt, a fabric formed without weaving, made principally from wool. The making of it is an ancient art in some parts of Asia, but the first successful mechanical process was invented by J. R. Williams, an American, about 1825. It is made by forming the wool into thin sheets. A number of these are piled together and then submitted to pressure between rollers, some solid and some hollow, containing steam. The rubbing action forms them into a compact cloth, which is held together by the interlocking of the fibers. Such felt-goods as carpets and table-covers are usually printed with patterns in colors. Felt made from furs is used in the manufacture of hats, etc.

Fencing is the art of attack and defence with foils, swords or any weapon employed for cutting or thrusting. The rise of fencing has been due to the introduction of gunpowder, which rendered armor useless and made it more necessary to defend oneself with one's weapon. The rapier was invented for attack alone, and the dagger used for defence. The use of the blade as both "sword and shield" is a later development, which involved the shortening and lightening of the rapier. The Italian style of fencing is active and violent; the French, which is now more popular, is guarded and reserved. German fencing resembles the Italian type. In student-duels a double-edged blade, sharpened near the point, is the weapon employed. In French duels a regular type of small sword, for pointing only and not for thrusting, about 33 inches long, is the ordinary weapon. In fencing, gloves, a leather breastplate and a wire mask should be worn. The foil, which is of steel, is covered at the point by a rubber button.

Some of the terms used in fencing occur so frequently that they should be defined. A *feint* is a movement to mislead. A *riposte* is a thrust made after a parry. A *parry* is a defence against a thrust. The *appel* is a smart stamp of the right foot upon the ground in a retreat or a feint. *Prime* and *quarte* refer to the part of the body to the left of the blade and above the hand, *septime* and *quinte* are also to the left but below the hand. To the right above the hand are *tierce* and *sixte;* while *octave* and *seconde* are on the right below the hand. In a *lunge* the right foot is advanced, the left leg straightened and the arm thrust straight forward from the shoulder. To be *engaged* is to be opposite one another upon guard. To *feel the blade* is to rest one's sword lightly against the sword of the other in order to foretell his next attack. But the eye is ever the best index of such an intention.

Fénelon (*fā-ne-lôn'*), **François de Salignac de la Mothe** a priest of the Roman church, was born in the Chateau de Fénelon, Perigord, France, on Aug. 6, 1651. Early in life he showed signs of great piety, and in his twentieth year entered the newly-founded seminary of St. Sulpice to study for the priesthood, and was ordained in 1675. In 1689 Louis XIV appointed him preceptor of his grandson, the young duke of Burgundy. As an acknowledgment of his merits, the king in 1694 presented him to the abbey of St. Valery and in the following year to the archbishopric of Cambrai. Fénelon was a man of breadth of character and practical piety. In middle life he engaged in a long controversy with Bossuet which ended by a decision of the pope against him, March 12, 1699. The beauty of his character was well-brought out in his taking the first opportunity to publish from his own pulpit the brief of his condemnation. His benevolence, charity and liberality were recognized by the allied army in 1709, which was instructed to spare the palace and stores of the archbishop of Cambrai. Fénelon died on Jan. 7, 1715, and was buried in his cathedral. See Mrs. H. L. Lear's *Life*. His writings include the famous *Adventures of Télémaque* and *Dialogues of the Dead.*

Fe'nians, a political association of Irishmen having for its object the overthrow of British rule in Ireland. The name is said to be derived from an Irish military organization, called Fionna Eirinn, founded by Sedna II about 400 B. C. The modern

Fenian movement had its first seat in America in 1846, the headquarters being New York. Agents were sent to England and Ireland to incite rebellion, but were unsuccessful. Three times Canadian territory has been invaded from the United States in times of peace by bands of Irishmen, seeking to incite rebellion and disorder in fancied revenge upon Great Britain. On March 17, 1866, St. Patrick's day, the militia of the Dominion were forced to guard the frontier. On May 25, 1870, O'Neil crossed the frontier at Trout River in a demonstration against Quebec, to be driven back by the volunteers. The next year an attempt to invade Manitoba ended in force, the United States government following him over the line and arresting him. The Fenian spirit appeared again in 1883 in the Skirmishing Fund, raised to promote the free use of dynamite for the destruction of British shipping and buildings. See J. Rutherford's *Secret History of the Fenian Conspiracy.*

Ferdinand I, the Great, the first sovereign of independent Castile, was born in 1000, and died on Dec. 27, 1065. He became king in 1035 and largely extended his dominion in 1053 by defeating his brother, Garcia III of Navarre, and annexing a large portion of his provinces. Early in his reign he fought against the Moors and extended the Christian frontier by defeating the emirs of Toledo, Saragossa and Seville. He laid claim to the title of emperor of Spain, and a decision favorable to his rights was given at a conference held at Toulouse, so far as they related to the territories which had been conquered from the Moors.

Ferdinand III, king of Castile and sometimes known as Saint Ferdinand, was, on the death of Henry I of Castile, proclaimed king. On the death of his father, in 1230, he also became king of Leon. His energies were chiefly devoted to the prosecution of wars against the Moors, and among his victories are those of Cordova in 1236 and Seville in 1248. He died at Seville on May 30, 1252, while planning an invasion of Africa. Ferdinand III was a champion of the Christian faith, and for his zeal was canonized by Pope Clement X in 1671. His feast-day in the Spanish calendar is May 30.

Ferdinand V of Castile, II of Aragon, III of Naples and II of Sicily, was born in Aragon, Spain, on March 10, 1452. He married Isabella, the sister and heiress of Henry IV of Castile, and they were crowned joint sovereigns of Castile. He was surnamed the Catholic, because of his zeal for Christianity. He drove out the Jews, numbering about 160,000, from his kingdom and ended the Moorish power in Spain (1492). He added Naples and Navarre to his dominion, and united the whole peninsula, excepting Portugal, into one state. He was one of the ablest princes of his age, though crafy, ambitious and untruthful. He died on Jan. 22, 1516. The most interesting event of his reign to Americans, the discovery of America by Columbus, owes little if anything to his influence. This honor belongs to Isabella. See Prescott's *History of Ferdinand and Isabella.*

Ferdinand I, emperor of Germany from 1556 to 1564, was born at Alcalá, in Spain, in 1503. He was the son of Philip I and brother of Charles V, whom he succeeded. In 1521 he married Anna, daughter of Ladislaus, king of Bohemia and Hungary; and when her brother Louis fell in battle, in 1526, he claimed the crown in right of his wife. After a series of bloody battles he gained the upper hand, and secured Bohemia to the house of Austria. He died at Vienna in 1564, and was succeeded by his son, Maximilian II.

Ferdinand II, emperor of Germany from 1619 to 1637, was born at Gratz, Austria, on July 9, 1578. It is said that he took an oath to reinstate the Catholic religion in his dominions at any cost. When he became emperor of Germany, he extended this religious war, which had begun in his own duchy of Styria, over a large part of Europe. This was the famous Thirty Years' War. He had subdued nearly all of his subjects and almost stamped out Protestantism, when the great Protestant hero, Gustavus Adolphus of Sweden, appeared upon the troubled scene. The ability of the Swedish generals being more than a match for that of the Austrian generals, the balance of victory reverted to the Protestant arms, and ere Ferdinand died, on Feb. 15, 1637, he had lost all hope of ever attaining his object. His reign is one of the most disastrous in history, for Germany owes him nothing but bloodshed, misery and desolation.

Ferdinand III, emperor of Germany from 1637 to 1657, was the son of Ferdinand II, and was born at Gratz, Austria, on July 11, 1608. His reign was more peaceful than that of his father. He died on April 2, 1657, after having concluded an alliance with Poland against Sweden. He was succeeded in the German empire by his son, Leopold I.

Ferdinand I, king of Naples, an illegitimate son of Alphonso V of Aragon, was born in 1423. He succeeded to the throne in 1458, but was not recognized by Pope Calixtus III, who championed the cause of John of Anjou, and was defeated by him on July 7, 1460. In the meantime Pius II succeeded Calixtus, and Ferdinand, by making certain concessions, obtained recognition and defeated John of Anjou on Aug. 18, 1462. He died on Jan. 25, 1494.

Ferdinand IV, king of Naples, was born at Naples on Jan. 12, 1751, and when his father ascended the Spanish throne in 1759, Ferdinand succeeded him on the throne of

Naples, under a regency. His minority ended on January 12, 1767, and the following year he married Maria Caroline, daughter of Empress Maria Theresa. During the wars of Napoleon Ferdinand was forced several times to leave his country, but was finally recalled to his capital on Dec. 12, 1816. He died on Jan. 4, 1825.

Ferdinand VII, king of Spain, was born on Oct. 14, 1784, and became prince of the Asturias in 1788. For political reasons his father, Charles IV, was forced to abdicate the throne, and Ferdinand was proclaimed king on March 19, 1808. When Napoleon invaded Spain, he forced Ferdinand to resign, and Joseph Bonaparte was proclaimed king in his stead. Wellington's victory at Vittoria on June 21, 1813, induced Napoleon to treat again with Ferdinand, and as a consequence he recognized his title to the throne of Spain, one of the conditions being that the English were to be expelled from the peninsula. Ferdinand was continually in open conflict with the Cortes, and his death at Madrid in 1833 was signalized by the outbreak of a long and bloody civil war. Ferdinand VII was one of the most incompetent monarchs that ever reigned. During his sovereignty Spain lost New Granada, Mexico, Rio de la Plata, Chile, Venezuela, Guatemala and Peru.

Fer'guson, James, a self-taught astronomer, was born near Keith, Scotland, in 1710. When he was eight, his father, in repairing the roof of their cottage, which had fallen in, used a lever and fulcrum. This at once interested the boy, and he began to experiment with levers, to which he added a wheel and axle. Apprenticed to a farmer, he studied the stars while watching the sheep by night. He made a wooden clock, and helped to support himself by repairing clocks and taking portraits in India ink. He received a small pension from George III, and died, probably in London, on Nov. 16, 1776. He invented astronomical machines, and wrote works on astronomy, among them *Astronomy Made Easy.* See *Autobiography* and *Life* by E. Henderson.

Fer'menta'tion, the decomposition of certain substances by the action of living plants either directly or though the enzymes (which see) secreted by them. All fermentable substances are complex carbon-compounds, especially carbohydrates (such as sugars) and proteids (abundant in white of egg, meat, curds, etc.) The fermentation of proteids and other nitrogenous substances, usually accompanied by evil-smelling gases, is often called putrefaction, but it does not differ in nature from other fermentations. Gases are a common product of fermentation, but not a necessary one. All protoplasm appears to have the power of producing fermentation under certain conditions. Many plants can in this way, instead of by normal respiration, secure energy sufficient to maintain life for some time without free oxygen. Ripening fruits, as pears and apples, and chopped-up plants, as fresh ensilage, show energetic fermentations of this direct kind. During such periods the usual functions of the plant are retarded or suspended, in which they differ from the lower organisms. The decomposition of foods in digestion is not ordinarily thought of as fermentation, but it is impossible to distinguish the two clearly.

A number of plants of the simpler sorts, notably yeasts, certain moulds and most bacteria, produce conspicuous fermentations, each after its kind. They therefore are called ferment-organisms or, formerly, ferments. As enzymes were also called ferments, the two were distinguished as organized and unorganized ferments. Since many of the ferment organisms act as such by secreting enzymes (*e. g.* yeast), the distinction is invalid.

Fermentations usually take their names from the most striking products. Thus, yeasts and some moulds work *alcoholic* fermentation in sugary liquids, forming alcohol, carbon dioxid and several less important products; certain bacteria cause the souring of milk on account of the formation of lactic acid, etc. (lactic F.); others form acetic acid, etc. (acetic F.) from alcohol. as when wine or beer sours. Many other forms of fermentation occur, the products of one being the material for subsequent decomposition. Some fermentations, especially the alcoholic ones, are of much economic importance. Thus the making of bread, wine, beer, vinegar, butter and cheese is dependent upon the proper action of the ferment-organisms that grow in these substances. Many household and commercial processes, as canning, cold storage, etc., are to prevent the growth of ferment-organisms. C. R. Barnes.

Ferments. See Enzymes and Fermentation.

Fern, a flowerless plant growing from a rootstock, producing spores instead of seeds, the leaves or fronds usually raised on a stalk. The notable fern-families include the tall swamp-ferns; coarse ferns, large and coarse ferns of swamps and woods; small and medium-sized ferns; delicate rock or wood-ferns; shield-ferns. The brake is the most widely distributed of the ferns; in Oregon it sometimes reaches a height of seven feet. The delicate maidenhair is one of the most highly regarded ferns, its haunt dim, moist woods. The tiny leaves on the slender black stem suggest fragility, but this fern will bear transplanting if a shady, damp corner is provided for the replanting. The evergreen wood-fern, a feature of our northern woods, flourishes throughout the year; it varies from a few inches to three feet in height. As a rule ferns other than the evergreens are not to be seen until the latter part of April, at which time the rolled-up fronds appear; some well-protected in warm wrappings, some quite naked. By May they show in their beauty of delicate tracery and fresh greenness; by June they are well-grown; by mid-July they are in most luxuriant leafage and many in fruit. August is considered the best month in which to search for our rare ferns. In the fall the hardy brake turns brown and withers soon; most of the other ferns follow the fashion of the trees in the matter of autumn coloring. See Parsons: *How to Know the Ferns.* See FILICALES.

Fernando Po. See SPANISH AFRICA.

Fernie, a town of 3,500. It is 65 miles east of Cranbrook on the Crowsnest Pass Railway. It is noted as being the center of the coal-mining industry for this part of British Columbia. The coal-mines in and near the town are practically inexhaustible. The demand for coke and coal is daily increasing, and this ensures continued growth and prosperity for the town. Toronto capitalists largely control the coal industries at Fernie.

Ferrara (*fĕr-rä′rä*), capital of the province of the same name, in Italy, is situated on the River Po, 30 miles from the Adriatic. The most noticeable building is the ducal palace of the Estes, built in the 14th century. It is remarkable for its art-associations. Under the dukes of Este it produced a good school of painters, and in literature it is closely associated with Tasso, Ariosto and Guarini. The university, founded in 1264, has a library of 100,000 volumes. Ferrara was the birthplace of Savonarola. At the period of its greatest prosperity it had a population of over 100,000, and now has 82,310 inhabitants.

Ferret, a small, slender animal of the weasel family, closely allied to the polecat. Its color is usually a yellowish white, its length about 14 inches, and tail 5½ inches. It originally was imported into Europe from Africa. It is used in rabbit-hunting to drive rabbits out of their holes and also as an aid in getting rid of rats and mice. Even though raised in confinement, it never becomes really tame or trustworthy. Like the weasel it will make sad havoc in a poultry-yard, merely sucking the blood of the fowl it kills. It has been known to do serious injury to infants. Unlike the polecat, it is very sensitive to the cold.

Fer′ry, a passage by boat across water. Ferry-boats are made large to accommodate both foot-passengers and horses and carriages. They are either rowed across or drawn by a cable. Steam is also used to propel them.

Ferry, Jules François Camille, French statesman, was born at St. Dié in the Vosges, France, April 5, 1832. After being admitted to the bar in 1854 he allied himself with the opponents of the empire and carried his hostility into journalism. He was elected to the legislature in 1869 and voted against the war with Prussia. He formed a cabinet in September, 1880, which remained in office until November, 1881, and he again became premier in 1883. He was defeated in 1885, on account of his foreign policy, which involved disaster to the French troops in Tonquin. He died at Paris on March 17, 1893.

Ferryland, an electoral district of Newfoundland. Population 5,697; chief towns, Ferryland, Renews, Fermense, Witless Bay, Cape Broyle and Bay of Bulls.

Fertiliza′tion (in plants). The act of union of the male and female cells, commonly known as sperms and eggs. Among plants the name is technically applied only when the sexual cells can be distinguished as male and female. When the sexual cells are alike in appearance, the process is spoken of as conjugation. The word fertilization, however, in a general sense covers the whole sexual process, and fertilization is present in all plants excepting in the very lowest thallophytes. The real significance of the process is not understood, since asexual methods of reproduction are often more common. The result of the union of the sperm and egg is the formation of a sexual spore, known in plants as the oöspore or fertilized egg, by which a new plant is developed.

Fer′tili′zers are materials added to the soil to replace those taken from it by plants, or, in a broader sense, added to affect its physical nature. They may be commercial fertilizers, barnyard manures, compost or green manures. The element most likely to be lacking is nitrogen; after that phosphoric acid and potash. Nitrogen is needed especially to produce stem and foliage, potash for flowers, fruit and seed, and phosphoric acid for general plant-vigor. The most valuable source of nitrogen is nitrate of soda, commonly known as Chile saltpeter; muriate of soda is obtained principally from deposits in Germany; and phosphoric acid from lime-phosphates, abundant in the southeastern states and usually requiring special chemical treatment to make the acid available to the plant. Other sources of these substances are cotton-seed meal, slaughter-house tankage, dried blood, dried fish, bone, wood-ashes, tobacco-stems, horn and hoof shavings and leather-scraps. The plant-food in these varies in amount, and its availability varies according to the rapidity of their decay. Most states require on each package a guaranteed chemical analysis. But a fertilizer made up largely of leather-scraps or horn shavings would show a high percentage of nitrogen, but be of little value. The wise farmer buys his own raw materials and mixes them in proportion to suit his own crops and conditions. Commercial fertilizers are applied to fields dry, being spread broadcast and worked in or drilled in. The amount usually applied is from 400 to 600 pounds per acre. Ten pounds of nitrogen per acre furnished by a fertilizer are the least amount that will give satisfactory results; likewise 15 pounds of soluble phosphoric acid; and 20 pounds of potash. Such fertilizer is applied in gardens and lawns, either dry or in solution. The following complete fertilizer is recommended: ¼ pound nitrate of soda, one pound of acid phosphate, ½ pound muriate of potash, for every 100 square feet of garden. Lime acts principally to change physical conditions, compacting sandy soils and making stiff clay-soils loose. It also exerts some chemical influence. For barn-yard and green-cropping manures see MANURES, NITROGEN-GATHERING CROPS and ROTATION OF CROPS. See Robert's *Fertility of the Land*, Snyder's *Chemistry of Soils and Fertilizers* and bulletins of state experiment-stations and the U. S. Dept. of Agriculture.

Fes'senden, William Pitt, an American statesman, was born at Boscawen, N. H., on Oct. 16, 1806. He was elected in 1832 to Maine's legislature as a Whig, and in 1854 the Whigs and free-soil Democrats elected him to the United States senate. He became one of the leaders of the newly organized Republican party, and was a member of the peace congress in 1861. He was secretary of the treasury from 1864 till his resignation in 1865, when he again entered the senate. He was ranked among the first lawyers of the United States, and had few superiors as a debater. He died at Portland, Me., on Sept. 1869.

Fetich (*fē'tĭsh*), an article of worship capable of being appropriated by an individual. It is not strictly an idol, but the dwelling-place of a spirit. Flints, shells, claws, feathers, earth, sand, plants, trees, mountains may become fetiches, provided the belief exists that a spirit is lodged within them. They are attached to individuals, families and tribes. Crooked sixpences, horseshoes and four-leaved clovers, as used for "luck," are very much like the fetiches of savages. The worship of fetiches is called fetichism. See A. B. Ellis' *Tshi-Speaking People of the Gold Coast.*

Feu'dal System in the middle ages formed the connecting link between early society and the modern reign of law and order. It was based on the holding of land, and the result of the system was the establishment of the various great European powers on the ruins of the Roman empire. The feudal theory was that the king was the absolute owner of all the land in the kingdom; the chief lords held their lands from him on the condition of military service. Such was the principle of the system that prevailed over France and Germany at the time of the Norman conquest. William I introduced feudalism into England, where it prevailed in some form or other until the restoration of Charles II. The remains of the feudal system may be seen on the banks of the Rhine better than anywhere else. There are the castles of the feudal baron, the villages of his dependents and the church whose priest was his tenant. See Seebohm's *The English Village Community.*

Fez, the second capital of Morocco, is situated in a valley on the northwestern side of the Atlas Mountains. The city is surrounded with walls from 30 to 40 feet high, and with towers at intervals for cannon. The streets are narrow and unpaved, and the houses low, but their interiors often are very beautiful. There are large palaces for the sultan, and 11 large mosques, one, the mosque of Karubin, being of immense size, with 800 pillars. Tanning, weaving, pottery, fez-caps and morocco leather, particularly the red, are among the manufactures. The university, founded in 859, is one of the oldest and largest in North Africa, and at present has about 700 students with 40 professors. The population is estimated at about 140,000, made up of Arabs, Berbers, Jews and negroes. Fez was founded in 808, and has for many years been the sacred city of the Mohammedans. See De Martinière's *Morocco* (English translation).

Fezzan (*fĕz'zän'*), a province of the Turkish empire, attached to Tripoli. It extends 390 miles north and south and 300 miles east and west. Its area is about 150,200 square miles. The inhabitants of the province number about 50,000, and are a mixed race. They are frivolous yet honest, and are notorious for their immorality. The principal town is Murzuk, having a population of about 6,500. Fezzan belongs to the desert-region of North Africa. See Barth's *Travels in Central Africa.*

Fiber, a substance resembling a thread or bundle of threads, which is either of animal or vegetable origin, except asbestos, the only mineral fiber known. Fiber is used in manufactures, and its value depends upon the structure, strength, elasticity, length, fineness and ability to absorb colors, as in dyeing. Human hair and horsehair, which are fibers, are not very useful in manufactures, because they are too smooth to hold together when twisted into a yarn. Fibers of wool, silk, cotton and flax have projections seen only under a microscope; or they will twist and curl, so that when made into yarn (or thread) they will not untwist. Among animal fibers used in the arts are wool, fur and silk. Vegetable fibers come from different parts of plants.

From the bark of some we have flax, hemp, jute and the material for paper. Cotton-fiber, the most valuable fiber known, consists of the hairs which surround the seeds of the plant. Coir fiber is from the husk of the cocoanut. From the leaves of palm-trees we have a fiber used in making ropes, mats, matting and Panama hats.

Fibre-Industries. The chief fibre-manufactures are those which involve the making of cloth; but the making of brushes, brooms, ropes, cords etc. must also be classed under fibre-industries. Many fibre-industries are not commercial but purely local; for example, the use of grasses and palm-leaves in the building of houses and the manifold uses of the bamboo. The United States import over $30,000,000 worth of raw fibre per year, and several times this quantity of manufactured fibre. For details of fibre industries in the United States see *United States Department of Agriculture, Fibre Investigations, Report No. IX.*, Washington, 1897. See COTTON, FLAX and WOOL.

Fichte (*fik'te*), **Johann Gottlieb,** a great German philosopher, was born near Bautzen, Germany, on May 19, 1762. He studied at the University of Jena, first theology and then philosophy. In 1791 he met Kant, whose disciple he had become. The publication of his *Critique of all Revelation* brought fame at once, and the appreciation of Kant, who had before treated him coldly. He held the chair of philosophy at Jena and also at Erlangen, and was appointed by the king to draw up a constitution for a new university at Berlin, of which he was elected rector, with such associates as Humboldt, De Wette, Schleiermacher and Neander. In 1813, during the war of independence, Fichte's wife volunteered her services as nurse in the crowded hospitals of Berlin, and, after five months of devotion to the sick, she was taken with the fever herself. She recovered, but her husband caught the infection, and died at Berlin, on Jan. 27, 1814. Fichte's *Address to the German Nation* and lectures *On the Nature of the Scholar*, are among his most famous as well as popular works. In philosophy he formed no school, but his influence on German philosophy and, through the writings of Carlyle, on English thought has been important. *The Vocation of the Scholar*, *The Vocation of Man, Characteristics of the Present Age* and *The Way to the Blessed Life* are among his philosophical works which have been translated into English. See *Memoir*, by Dr. William Smith, prefixed to a translation of his works; also *Life* by Adamson, in Blackwood's *Philosophical Classics*.

Fidelio or **Conjugal Love.** Beethoven's sole opera; known also as *Leonora*, for which four overtures were composed. First produced at Vienna, on Nov. 20, 1805, a revised edition, approved by Beethoven, was brought out in 1814, when the overture in E was first played. Imperfectly understood during the composer's life time, it now is regarded as one of the noblest types of musical dramatic art.

Field, Cyrus West, an American merchant and scientist, a brother of David Dudley Field, was born at Stockbridge, Massachusetts, on Nov. 30, 1819. He went to New York at fifteen, beginning life as a dry goods clerk at $50 a year. He built up a prosperous paper-manufacturing business, in which he was engaged for twelve years, leaving it in 1854 to enter upon his great work, the laying of the Atlantic cable. Devoting himself entirely to the task of "mooring the New World alongside the Old," he formed stock-companies, crossed the ocean repeatedly, and made every effort to interest the public in the scheme. The first successful cable was laid in 1858, but failed after being in operation a few weeks. He continued the struggle for twelve years, and at last, in 1866, established telegraphic communication between the two continents, which has never since been interrupted. Congress voted him a gold medal and the thanks of the nation, and John Bright called him the Columbus of modern times. He afterward helped to develop the elevated-railroad system in New York. He died at New York on July 12, 1892.

Field, David Dudley, American jurist, was born at Haddam, Conn., on Feb. 13, 1805, and died at New York, on April 13, 1894. He was educated at Williams College, and in 1828 was admitted to the New York bar. In the forties and fifties he took active interest in civil and criminal procedure, and in 1847 was appointed commissioner on practice and pleadings. In 1857 he was employed by New York state to prepare a political, penal and civil code, which was enacted into law. In 1873 he presented to a social science congress outlines of an international code, which was translated into several languages, and resulted in the formation of associations for the reform and codification of the laws of nations. See his collected *Speeches, Arguments and Miscellaneous Papers*.

Field, Eugene, American journalist, styled the Poet Laureate of the Children, was born at St. Louis, Mo., on Sept. 2, 1850. He studied at Williams College, Knox College (Galesburg, Ill.,) and the State University of Missouri, after which he for a time traveled in Europe. His first newspaper work was with the St. Louis *Journal* in 1873. He held positions later on papers in St. Joseph, Kansas City and Denver. In 1882 he became connected with the *Chicago Morning News*, afterward *The Record*, and here his best work was done. His poems on subjects relating to childhood gave him his widest fame. His *Little Boy Blue, Wynken Blynken and Nod, Jes' fore Christmas* and *Seein'*

Things are all familiar to school-children. His own seven children were the joy of his life. It would be difficult to name in American literary ranks a name more dear to letters than was Eugene Field. His prose-writings were marked by delicate sentiment and delicious humor, while personally he had a wide circle of friends who regarded him with affection and cherish his memory. In verse his work had the touch of the true poet—daintiness and pathetic beauty. His publications include *A Little Book of Western Verse; With Trumpet and Drum; Echoes from the Sabine Farm; Culture's Garland;* and, in collaboration with his brother, *Love Affairs of a Bibliomaniac*, etc. He died at Chicago on Nov. 4, 1895.

EUGENE FIELD

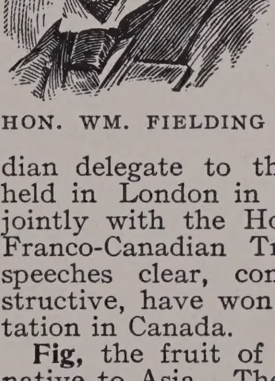
Field, Marshall, merchant and philanthropist, born at Conway, Mass., 1835. For a time he was a clerk in a store in Pittsfield, Mass., but in 1856 he secured a clerkship in a Chicago dry-goods store, and from 1860 to 1865 was junior partner in the firm. In 1865 he became a partner of the firm of Field, Palmer and Leiter, later Field and Leiter. In 1881 he became proprietor of the business, which was thenceforward conducted under style of Marshall Field and Company.

His business grew rapidly with the growth of Chicago and the development of the western country. At his death in 1906 he was head of one of the largest and best-known department-stores in the world. His business, which exceeded fifty million dollars a year, included a large wholesale as well as retail trade and the control of many factories in Europe and Asia and even Australia for the manufacture of the goods he sold. Fortunate investments in Chicago real-estate and in industrial and railroad stocks contributed much to the increase of his wealth. He gave eight million dollars to Field Columbian Museum of Chicago and to the University of Chicago a valuable piece of land for the purpose of athletics, now known as Marshall Field.

Field, Stephen Johnson, American jurist, brother of David D. and Cyrus Field, was born at Haddam, Conn., on Nov. 4, 1816, and died at Washington, D. C., on April 9, 1899. A graduate of Williams College, he studied law, and in 1849 settled in California, where he became member of the state legislature, and in 1859 was elected to the supreme court of the state. In 1863 he was appointed an associate-justice of the United States supreme court. He later was professor of law in the University of California, and acted as a member of the Hayes-Tilden electoral commission. In 1880 he was a candidate for the presidential nomination and received 65 votes in the convention. In 1897 he retired from the supreme court. He died on April 9, 1899.

Field'ing, Henry, a great English novelist, was born at Glastonbury, England, on April 22, 1707. He studied at Eton and at Leyden University. He began his literary career by writing comedies, *Love in Several Masques* being the first and among the best. He managed a theater for awhile, and also studied law and edited several newspapers. But his fame rests upon his three novels, *Joseph Andrews*, written in 1742, in ridicule of Richardson's *Pamela*, which had just appeared; *Amelia;* and the famous *Tom Jones*. Scott calls him the Father of the English novel. He died at Lisbon, Portugal, on Oct. 8, 1754, and was buried in the English cemetery there. See *Life*, in the English Men of Letters series, by Austin Dobson.

Fielding, Hon. William S., born and educated in Halifax, Nova Scotia. He engaged in newspaper work in Halifax for 20 years, was elected to the Nova Scotia Assembly in 1882, and was Premier from 1884 to 1896. He became a member of the Federal Government in 1896, taking the position of Finance Minister of the Dominion. He introduced the preferential tariff in favor of Great Britain. He was Canadian delegate to the Colonial Conference held in London in 1902, and negotiated jointly with the Hon. L. P. Brodeur the Franco-Canadian Treaty. His budget speeches clear, concise, suggestive, constructive, have won for him a great reputation in Canada.


HON. WM. FIELDING

Fig, the fruit of *Ficus carica*, which is native to Asia. The genus is an enormous one in the tropics. There are about 150 different varieties of cultivated figs. The finest figs are the so-called Smyrna figs, which are grown in the eastern Mediterranean region. Figs have been cultivated on the Pacific coast for more than a century. The cultivation of figs in California has attained large proportions. The commercial fig is the dried fruit, although where grown the fresh figs are used. One of the old fig-trees of California rises 60 feet, its trunk measuring 9 feet. There are three crops a year, the second the most important. The tree has few insect-enemies, and is considered one of the most beautiful of fruit trees. It grows readily from cuttings, and is propagated also by budding, grafting and seeds. The highly-regarded Smyrna figs, now successfully grown in California, do not bear staminate flowers, and near the trees it is necessary to plant the wild or Capri figs, which alone of the figs bear staminate flowers. To obtain pollination, the fig-wasp, which inhabits wild figs and visits the cultivated fig, has been brought into the country.

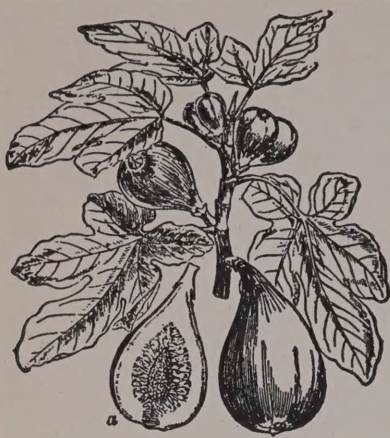


FIG PLANT
Fig. *a*. Fruit shown in section

Fiji Islands (*fē′jē*), a group of islands belonging to Great Britain, situated in the South Pacific. Their nearest neighbors are the Friendly Islands, 200 or 300 miles southeast. They are 4,700 miles from San Francisco. They lie in a ring, open on the south, and number about 200. The area is 7,435 square miles, nearly the size of Wales. They are of volcanic origin, and are surrounded by coral reefs, are well-supplied with harbors and rivers, possess a rich soil and fine climate, but suffer from hurricanes and earthquakes.

Natural Resources. With the exception of the pearl-shell industry, the resources are almost entirely agricultural. Bananas, bread-fruit, cocoanuts, sugar, corn, cotton, tea and coffee are among the products. There are hardly any native animals and few minerals.

Races. The people belong to the Polynesian race, and until the introduction of Christianity, were fierce cannibals—the terror of the sailors in those regions.

Manufactures. Considerable distilled spirit is manufactured, and there are six sugar-mills, one tea-factory, one soap-works, two saw-mills and 17 boat-building yards.

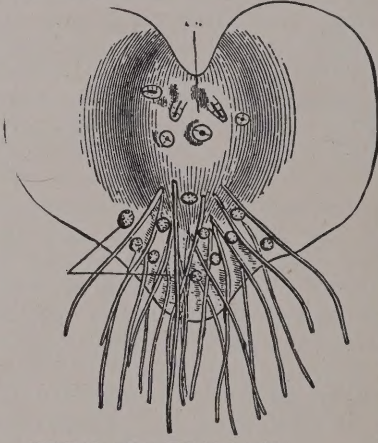
Commerce. Fiji is in regular communication with New Zealand, Australia, Canada, Honolulu, Tonga and Samoa. A subsidized steamer trades regularly within the group. There are an overland telephone from Suva to Lautoka, 120 miles long, and a telegraph between Suva and Levuka, 45 miles by land and 12 by submarine cable. The principal exports are sugar, bananas and fruit, copra and *beche-de-mer;* the principal imports, textile fabrics, hardware and iron, machinery, coal and timber. Maize is grown in exportable quantities.

History. The islands were discovered by Tasman, the great Dutch sailor, in 1643. Turtle Island was discovered by Captain Cook in 1773. In 1835 Wesleyan missionaries came from Tonga and began the wonderful work which resulted in the Christianizing of the islands. The Wesleyans now number about 100,000, and the Catholics 10,000. Since 1858 the islands have been governed by Great Britain, though not formally taken into her dominions until 1874.

Population. The total estimated population on Dec. 31, 1909, was 133,831, divided between Fijians, Rotumans, Indians and whites, the last numbering 2,459. In 1903 births among Fijians numbered 3,431, and deaths 3,298, while the Indians showed 910 births to 545 deaths and the whites 89 births to 37 deaths. Part of this is due to the fact that the population other than native has already undergone a process of selection, but it presages the passing of an interesting race.

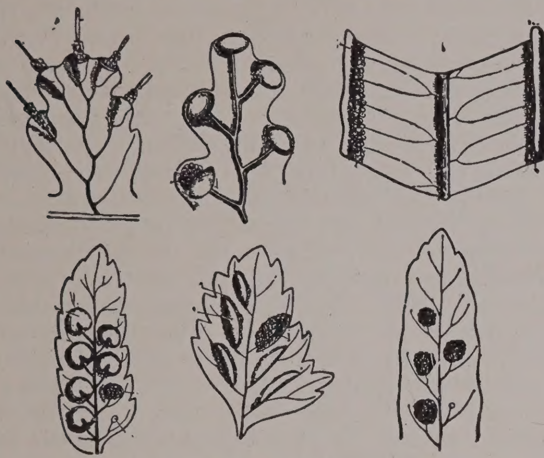
Fil′ament (in plants), the stalk-like portion of a stamen. (See FLOWER.) The name is also constantly applied to the peculiar thread-like bodies of algæ and fungi.

Fil′icales. The greatest group of pteridophytes, including the forms commonly known as ferns. About 4,000 species of ferns are known, the large majority occurring in the tropics, where ferns of great size grow, including the well-known tree-ferns. The ordinary ferns of the temperate regions consist only of leaves above the surface of the ground, these leaves arising from a subterranean stem. On account of what seemed to be the peculiarity of a leaf rising directly out of the ground, the name frond was once given to fern-leaves. Usually upon the under surface of these leaves the so-called fruit-dots appear, which technically are known as the sori. Each sorus or dot consists of a group of sporangia, each sporangium containing numerous spores. The sori are often protected by a flap which is an outgrowth of the epidermis and is known as the indusium. Occasionally, as in the maiden-hair fern and common bracken, the sori are along the leaf-margins.



FERN PROTHALLIUM

and these margins inroll to protect them. Each sporangium is a spore-case upon a slender stalk, and about the case a ring of thick-walled cells is developed, known as the annulus. This ring of cells aids in rupturing the sporangium wall and discharging the spores. When a spore germinates, it develops a minute, flat, green plant known as the prothallium, which bears the sex-organs. The prothallium, therefore, is the gametophyte. By the union of the sex-cells (sperm and eggs) the fertilized egg is produced, which upon germination gives rise to the well-known fern plant, the sporophyte. In the fern, therefore, the alternation of generations is very distinct, the gametophyte and sporophyte being independent of one another, so far as nutrition is concerned.


SORI OF VARIOUS FERNS

MILLARD FILLMORE

Fill'more, Millard, thirteenth president of the United States, was born at Summer Hill, N. Y., on Feb. 7, 1800. In 1819 he began the study of law; in 1823 he was admitted to the Buffalo bar; in 1828 he began his political career. In 1848 he was made Whig vice-president of the United States, and upon the unexpected death of President Taylor, in July, 1850, succeeded to the presidency, which he held until 1853. In 1856 he was nominated for the presidency by the American party, but received the electoral vote of Maryland only. He died at Buffalo, N. Y., on March 7, 1874.

Fil'ter, a vessel arranged for purifying water or other liquids. When water or some other liquid is passed through a substance, the pores or openings of which are too small to allow the solid particles to go through, they, of course, are kept back and the water is cleared The familiar process of straining is a good illustration of the principle of a filter. For home use, a simple water filter is often made by stuffing a sponge in the hole of a flower-pot, then a layer of pebbles, then one of coarse sand and one three or four inches deep of powdered charcoal, with a second layer of pebbles on top. The pebbles and gravel form the strainers, while the charcoal purifies by absorbing impurities, for which it has a special affinity. The charcoal needs to be renewed occasionally, as it loses its power, and the sand and gravel need cleansing. All filters, therefore, made on this principle, should be easily opened, so as to reach all parts. Water is often filtered, before entering a cistern, by an external filter, or in the cistern itself by means of a division-wall of brick, the water passing through the pores of the bricks. An excellent method of filtering water, devised by Pasteur, consists in forcing the liquid through unglazed porcelain. The process is slow but very effective. Special filters are required for syrups, oils and the like. Oil is passed through bags made of horsehair or canton-flannels; syrups through bags of flannel. Ale, beer and such liquids are difficult to filter, and usually need an addition of some clearing substance, as gelatine. The use of filters in the laboratory is important and extensive. Here the material used for filtering is usually paper which is manufactured for the purpose.

Finch, is the popular name for a large variety of birds, which for the most part belong to the scientific family *Fringillidae.* The birds called finches are for the most part small, often beautifully colored and not seldom endowed with the gift of song. In the United States and Canada there are said to be 135 kinds of finches; and there, indeed, is no tropical or temperate country in which finches are not found, although some scientists have wrongly excepted Australia, where, in fact, finches are plentiful. The indigo-bird, purple finch, horse-finch, American goldfinch, pine-finch, grass-finch and rosy finch are among the best-known species in this country. Canaries and sparrows are also classed as finches.

Findlay, the county-seat of Hancock County, in northwestern Ohio, in 1885 received a considerable impetus from the discovery of extensive supplies of natural gas. Besides, there are oil, rich deposits of gravel and sand and beds of clay. Of late it has not grown much, though it has a number of industries, including glass-works, pressed-brick works, potteries, foundries, machine-shops, carriage, tool, furniture, and wooden-implement factories, rail and rolling-mills and an oil-refinery. The city has some fine civic buildings and a number of churches; it contains Findlay College and has excellent public schools. It is served by three railroads, and has all the adjuncts of a modern city. Population 20,000

Fine Arts. We have spoken of art as nature working through man's intention. It has also been defined as the doing, making or putting together of things by human skill to fit the purpose intended.

The definition of the useful and the fine arts has often been attempted by a contrasting of the meanings of the words fine and useful. This method may, however, leave opportunity for the interpretation that all fine arts are useless arts or that all useful arts are inferior arts. Modern thinking does not, however, admit of the fineness of useless things nor of the inferiority of useful ones. From what we have determined above, and what we know of the meaning of the word useful, we may easily define the useful arts as those doings, makings or puttings together, by which man supplements nature in providing the things which he *knows* he needs. The useful arts must, therefore, address themselves to and spring from man's reasoning power. Now it is quite possible, when all is said and done, that the fine arts deal with things no less important to man than those of the so-called useful arts. The distinguishing characteristic, however, which we observe in the case of the fine arts, is that here the doings, makings or puttings together address themselves to man's emotions — that they spring from his instincts or impulses rather than from his intellect. In the useful arts man is conscious of the need he is endeavoring to satisfy; in the fine arts he knows only that he is impelled to sing or dance or paint. It is quite conceivable that the only difference between these two forms of art is that they knock at different doors.

Man shudders with the cold and rain, or suffers from the sun's heat, and builds a roof and four walls within which to live. He has produced a work of useful art — the useful art of architecture. His house expresses his need of protection from the elements by tacitly meeting that need. But suppose he makes his roof project, so that a deep shadow will fall upon the walls when the sun shines, and that he makes the chimneys large, so that the house will not only be but *seem* to be a place of shelter and of warmth; and suppose that his columns be made broad at the base and lightened with decoration at their tops so that they seem to *prefer* to stand on end, as they do, and support the roof that is above them; then the house does more than merely withstand the elements, it goes so far as *to celebrate its triumph over them.* This is the *fine art* of architecture. Here we see *architecture* as a form of emotional expression — a language of the feelings. This very theme of triumph, it may be observed, has been sung, not in this art alone, but in every form of fine art. From the first aboriginal song and dance down to the days of the Sousa March, triumph has found expression in the fine art of *music.* In the days of the Romans and before and since it has been celebrated in the fine art of sculpture. In the days of the Egyptians as in our own the theme has been voiced through the fine art of *painting*; and in all times the fine art of *poetry* has made it the burden of its lay. So the common ground of the fine arts is the expression of the emotions.

Fine art may well be defined as a species of universal language. The joy, pain, devotion, scorn, patriotism, defeat or triumph which the poet felt who wrote the sonnet is felt again by the person who reads the sonnet. Fine art in other words, means a doing or acting, not on the part of the artist alone, but on the part of the appreciator as well. This is exemplified in dancing, which is a form of musical appreciation, and in which the listener becomes very evidently a part of the performance — coworker with the composer. Arthur B. Davies says: "When I paint a wave I *am* that wave." True. And it is quite as true that when you look at his painting of the wave *you* are that wave. When he sweeps his brush up over the canvas, he feels himself doing just what the wave is doing — he becomes, as he says, a sort of conscious wave; when you sweep your eye over the lines where his brush has led, you too, become a sort of acting, conscious wave. Ruskin describes a wave as "a flint cave — a marble pillar — a passing cloud." Here we have the principle which has just been stated, applied to poetry. We find ourselves, as we read, living the life of the wave, sharing its bygone past, its rushing present and its unknown future. When we hear Shakespeare's *Hamlet* into which, as we know, the author introduced many variations from historical fact, we, by reason of those very changes and interpolations, live the thing ourselves and slip into the emotions of its characters, as it were, so that they are our own emotions. When we read an unadorned statement of the historical facts upon which Shakespeare based his play, we get a far more positive knowledge of the precise things which did take place. We contemplate causes and effects, and make psychological or sociological deductions from them. We study the affair in an unprejudiced manner and wholly from without. And now we have described the two great forms of truthtelling. The first addresses itself to the senses or the feelings, springs from the emotion, and is comprehended by a reliving of it. This is fine art. The second is expressed in terms of reason, in terms of the intellect, and is understood through contemplation — a weighing and measuring of it. This is science. Neither one is the whole truth, neither one is devoid of truth. "Science is the knowing; art is the doing."

The scientist, we have said, measures, compares, expresses things in terms of each other, establishes the relations of things one to another. In answer to your question: "What is a wave?" he will tell you that a wave is the result of certain causes and principles; he will show you the materials that compose the wave; and, if your curiosity is still unappeased, he will separate those materials into their elements. He will show you the effects of conditions upon them, and he may continue, showing cause and cause of cause to the beginning of the world; or, in the other direction, he may deal with effect upon effect to the end of it. He always leads you into the relations of the wave to all other things and always *away from the wave itself*.

The artist on the other hand forces your attention *to the wave*, ignoring in his picture the fact that anything else exists. "The real work of art — its way leads nowhere and its frame ends the world." (Münsterberg). He bends all lines of attention *to* the thing in hand, fills the consciousness with it, excluding all other things, and uses it as a means of bringing you into the mood which he has experienced. Sleep is said to be the most agreeable experience of which we can know. It relieves us, for the time being, from all responsibility and the need of making any sort of choice or discrimination. Fine art brings us into a somewhat similar condition of repose or of absorption. It leads us, as it were, by making captive first our sense of seeing or of hearing or our imagination, and thence, through the unity and intensity of its interest, our whole consciousness, until like the children of Hamelin we forget all else and follow. But our enjoyment of fine art differs from our enjoyment of sleep. The enjoyment of fine art is the enjoyment of repose, it is true, but even in this repose there are a sort of activity and a full consciousness. When we are enjoying a lyric or a musical rhapsody or a symphony of color, we are living as intensely as at any other time, but our life is being led, and is simply free of the conscious effort of living.

The scope of this essay is to make clear the nature of fine art. It is not its purpose, however, to rehearse any justification of it. Fine art, it is true, does not appear to minister to any of the primal needs of food, raiment or shelter. We cannot here discuss the question as to whether or not man has any real needs other than these three, which, to be sure, he shares with all the higher animals. True it is, however, that the oldest relics of man's handiwork that have come down to us are examples of his fine art, and true it is that he has never ceased to paint and sing nor to admire and listen even to this day. GEORGE WILLIAM EGGERS.

Fine Arts, History of. A complete history of the fine arts, under which head we must include such forms of expression as architecture, sculpture, painting and decoration and the handicrafts, would at the same time be a history of the development of the esthetic, intellectual and religious nature of the human race. It would need to be considered in its relation to its primitive development, its climax and its decline.

Certain typical phases belong to the art of all races and individuals, and it is only these typical phases that can be clearly demonstrated in special cases that will be touched upon in the brief treatment that is necessary here.

It seems to be true the world around that pictorial expression was first of all a means of communication and was, as nearly as possible, representative of the object depicted. Gradually the truth to the object's form was replaced by some character that became the sign of the object. From these developed the characters that, finally, were used in the various alphabets. In the childhood of the race the tendency is to interpret natural phenomena in the terms of personal experience; and we find records of this personification and symbolism in both the construction and decoration of articles used in religious ceremonials and in the things of every day utility.

At first what seems to be decoration is not such in a strict meaning of the term, but is rather significant of a religious thought or is propitiatory in character.

Art in its strictest sense can only be said to begin when there is a distinct reaching out for the expression of beauty in the form of the thing created and when there is added to this endeavor the effort to make the form more beautiful by means of a suitable decoration. Symbolic use of decorative forms frequently precedes, by many generations, the studied effort so to use them that they are subordinated to the object, and frequently we find decorative forms, in the later phases of art, that have completely lost their significance.

In the decadent period of all arts we have finally lost both the symbolism of decoration and art-forms and the sense of its fitness, and find in their places a scarcity of originality and a realistic and frequently over-ornate use of natural forms. Any art that resorts to copying other forms, or to the copying of natural form for the sake of skillfully imitating it, has lost its inspiration and is in its decadence. At the present time we have, in the various countries of the world and among the barbarous and semibarbarous races, art in all its stages of development.

ORIENTAL ART.

Japanese Pottery. Probably there is no other place in the world where art is so much lived and lived with as in Japan. Every article of religious, military, domestic or personal use is produced with a special view to its being beautiful, not only in workmanship, but in its design and its adaptability to its use, by a class of artisans whose craft has descended through many generations. and thus represents an accumulated skill that is quite impossible under the factory-conditions which force each workman to execute only a part of the product. Things do not go out of style in Japan. The few things that are necessary are chosen with the utmost care, and, being hand-made and well-made, last a long time. The Japanese excel as metal-workers, enamelers, lacquerers, wood-workers, textile-makers, printers and potters. As space is so limited, the last named craft is the only one which will be treated here.

Japanese pottery is distinguished for refinement of form, varied and wonderfully executed design and unparalleled range of color. The most famous potteries are those of Arita, Kyoto, Kaga, Satsuma and Awari. Satsuma and Arita have produced both pottery and stoneware that compare favorably with anything of the kind that has been made anywhere in the world. The rudiments of this art as of many others were learned in China, and the Chinese influence is frequently traceable in the design. Japan is richly endowed by nature with all the materials in the form of clays and minerals that are used in the making of pottery and its colors, both of which they have used in bewildering variety.

In the 13th and 14th centuries there was a preference for the iridescent black, red, brown and dark-green of the Raku ware, but late in the 16th century, when the tea-ceremony became popular, taste in the matter of pottery underwent a marked change. Ninsei founded the kilns that produced the Awata, Kiomidzu and Omura wares. Ninsei was very skilled in the use of the brush, and decorated his wares with birds, flowers and human figures in creamy blue, light green and coral glazes. Kenzan and Yeiraku were famous potters who worked during the latter part of the 17th and the early part of the 18th century. Both were great colorists, but somewhat neglected form.

Japanese pottery can best be identified by its color. A soft gray-green is characteristic of the kilns of Sanda Seiji; grays and salmon of Haji; yellow-brown of Oki; and drip-glazes of Oriba. Satsuma is the most popular of all It is famous for its soft, creamy-white backgrounds that are like old ivory and for its soft colors and gold. The 19th century produced the Bizen ware that is remarkable for its wonderful metallic brown and blue glazes. At the present time the development of pottery is at a standstill, and many of the kilns are producing inferior articles for the foreign market. See Bower: *Japanese Pottery* and Hartmann: *Japanese Art.*

Japanese Painting and Sculpture. Sculpture and painting may be said to have had their beginning in Japan between the seventh and ninth centuries A. D. They were derived from China, as were the initial movements of all Japanese culture. The earlier phases both of painting and sculpture show, very distinctly, an Indian influence, and this is explained by the fact that Japanese art had its inspiration in the introduction of Buddhism that came into Japan from India through China and Korea. The native religion was Shintoism which is little more than a system of ancestor-worship. Its sacred colors were red and white, and its temples were extremely simple in construction, with no decoration worthy the name, and contained little else than the sacred mirror. Hence this form of worship offered few inducements for the development either of an architecture or design. Buddhism, on the other hand, had a well-developed ritual and an organized priesthood, and was rich in its system of symbolism of form and color.

We find that sculpture, except as it is used in decorative wood-carving, was not a natural means of expression, and it was soon abandoned in favor of a form of art that could be expressed with the writing-brush. Sculpture, therefore, must be placed early in the history of this art. It is restricted, almost entirely, to huge bronze statues of Buddha, prominent among which are the Buddhas of Nara and Kamakura, the latter of which is a seated figure nearly fifty feet high. It was completed in 1252, while the former was finished in 750. Besides these and other colossal bronzes there are many gigantic wooden temple-statues of Buddha and other gods and goddesses. This sculpture is frequently very vigorous in treatment, and emphasizes spirit rather than form. The sculptured decoration of the temples and temple-furnishings is lavish in its design as well as in its use of symbols and color.

The painting of Japan may be classified into seven distinct movements, namely, the Buddhistic from the ninth to the twelfth centuries; the Yamato-Tosa from the tenth to the fourteenth century; the Sesshiu from 1421 to 1507; the Kano from 1400 to 1750; the Okio or Shijo from about 1750 to the present period; and the Ukioye from about 1640 to the present time. The last-named school, which produced the color-print, will be treated in an article by itself.

The Buddhistic school produced most of the sculpture of Japan and represents the first attempt at painting. It was exclusively ecclesiastical in character, and was strongly influenced in spirit, treatment and color both by India and China. Its greatest artists were Kanaoka and Hirotaka, both of whom painted temple and palace-decorations. Its colors were rich blues, reds, greens and gold.

The Yamato-Tosa school, though classed as one, was in reality two different movements, the first of which was distinctly Chinese in its origin, while the latter was thoroughly Japanese. Most of its great paintings depict various phases of Japanese feudalism, the life of the court and of the soldier. The paintings of this school and those of the others, too, are almost incomprehensible to the foreigner. The western painter tells what he has to say in such a way that the scene, person or thing represented almost lives before our eyes, their form is so accurately painted. The oriental artist, on the contrary, is not trying to paint things realistically, but is trying to make us feel his poetic emotion by painting the merest suggestion of the form with the most beautiful lines and color at his command. He does not attempt, for instance, to imitate a cherry-blossom that he has plucked from the tree and brought into his studio as a model, but rather the life and spirit of all cherry-blossoms that he has gathered through all his life of loving observation; and so he paints what he considers the life and spirit of the landscapes, human figure and other things.

We frequently find in reproductions of the paintings of this school, the originals being very rare, the artist painting in such a way that the observer feels himself to be looking from a point above the scene; and where houses are shown, the roofs are left off, so that one looks down into the interior as well as seeing the outside at the same time. Many of the later artists of this school are represented by exquisitely dainty and idealized drawings of flowers, birds and other natural forms.

Among the prominent individuals of the Yamato-Tosa group are those of the members of the Minamoto and Mitsumoto families; and, later, Nobuzane, a great colorist, Mitsunobu, Mitsuoki and Mitsuyoshi. Tosan color was a new development, quite independent of that of the Buddhistic school. The predominating hues were gold, white, red, green, yellow and blue, which were used intensely strong, but so broken up and woven together that the result was not glaring but a rich, softened gray.

The next two schools were nearly contemporary, and their inspiration was Chinese. They were the Kano and Sesshiu schools, the former of which was founded by Cho Densu who tried to paint in the style of the Buddhistic artists; his successors, however, abandoned this idea and established a new style which was based on the brush line drawing of China. These men were great designers, and worked for many years in black and white exclusively, but later added color in imitation of the Tosa school. The masters of this school excel in technique of the brush as well as in design. They painted panels in which, as themes, they used animals, birds, fish, flowers and trees. Its great masters were Kano Motonobu, Kano Massanobu, Tanyu, Yeitoku and Korin, who is sometimes accounted the founder of an independent school. Korin was a master designer, lacquerer and colorist. Sesshiu was the founder of the school that bears his name. He studied in China, and he and his followers had ideals, and used a technique and subjects, that were similar to those of the Kano school.

The Okio or Shijo school, known as the naturalistic movement, was founded by Okio who aimed at realism in painting and dealt with such subjects as birds, fish, flowers, trees and landscapes. This realism was not the same as that of the western world, which always draws an individual thing in a given moment and light, but was rather a truth to nature that was the result of so thorough a knowledge of nature that it was possible to draw any of her forms without having the thing actually present as a model. Sosen, one of the artists associated with this naturalistic movement, was famous for his paintings of monkeys.

In later years the artists of Japan have been diverted from the development of their national ideals of art by an interest in the art of Europe and of America. There, however, are two men still living in Japan, who have endeavored to maintain in their own painting what is best in the ideals of Japanese art; they are Hashimato Gaho and Ogato Gekko, the former the chief professor in the Tokyo Academy of Fine Arts. See W. Anderson: *Pictorial Arts of Japan;* Lafcadio Hearn: *Glimpses of Unfamiliar Japan;* Sadakichi: *Japanese Art.*

Japanese Color-Prints. Although the Japanese have developed the process of color printing by means of engraved wood-blocks to a point of excellence beyond that attained by any other nation, they themselves do not class them as art, and their creators are considered nothing more than artisans. Perhaps this was because the painting and sculpture were under the direct patronage of the upper classes and dealt with subjects which touched only upon the ideals of culture which were a sealed book to the common people; and because the print-school from the very first sought to portray the life of the people and actors and other classes which were not recognized by those of higher rank. In fact, they seem to have chosen such subjects as would be appreciated by those who had not the means to purchase the examples of higher art. These prints, some of which now are sold in Europe and America for several hundred dollars, cost only a few pennies in the streets of Tokio at the time they were printed. Aside from the wonderful technique, their marvelous design and harmonious color have been the source of inspiration to more than one western artist, among whom we may mention Whistler and Monet.

There were three persons who were concerned in the production of a Japanese print. They were the artist, the engraver and the printer. The artist drew the design on thin transparent paper in outline, indicating by notes what colors were to be used and where they were to be placed. These outline-drawings were then turned over to the engraver, who pasted them face-down on blocks of cherry-wood, which was always cut with the grain. With a very simple set of knives, chisels and gouges he cuts around these lines and chips out the wood between them, until only the lines of the artist's brush are left as high as the surface of the block. Several prints are made from this line-block on transparent paper, which in turn are pasted face-down on other pieces of wood, from which are engraved blocks for each color which is to be printed. These various blocks are then turned over to the printer, who mixes his vegetable color with a thick rice-paste, and applies it to the block. Without moving the block on which he has spread his colors, he applies a moistened piece of paper, which he pats down on the colored block until it has absorbed all the color. This process is repeated until all the colors indicated in the artist's sketch are printed.

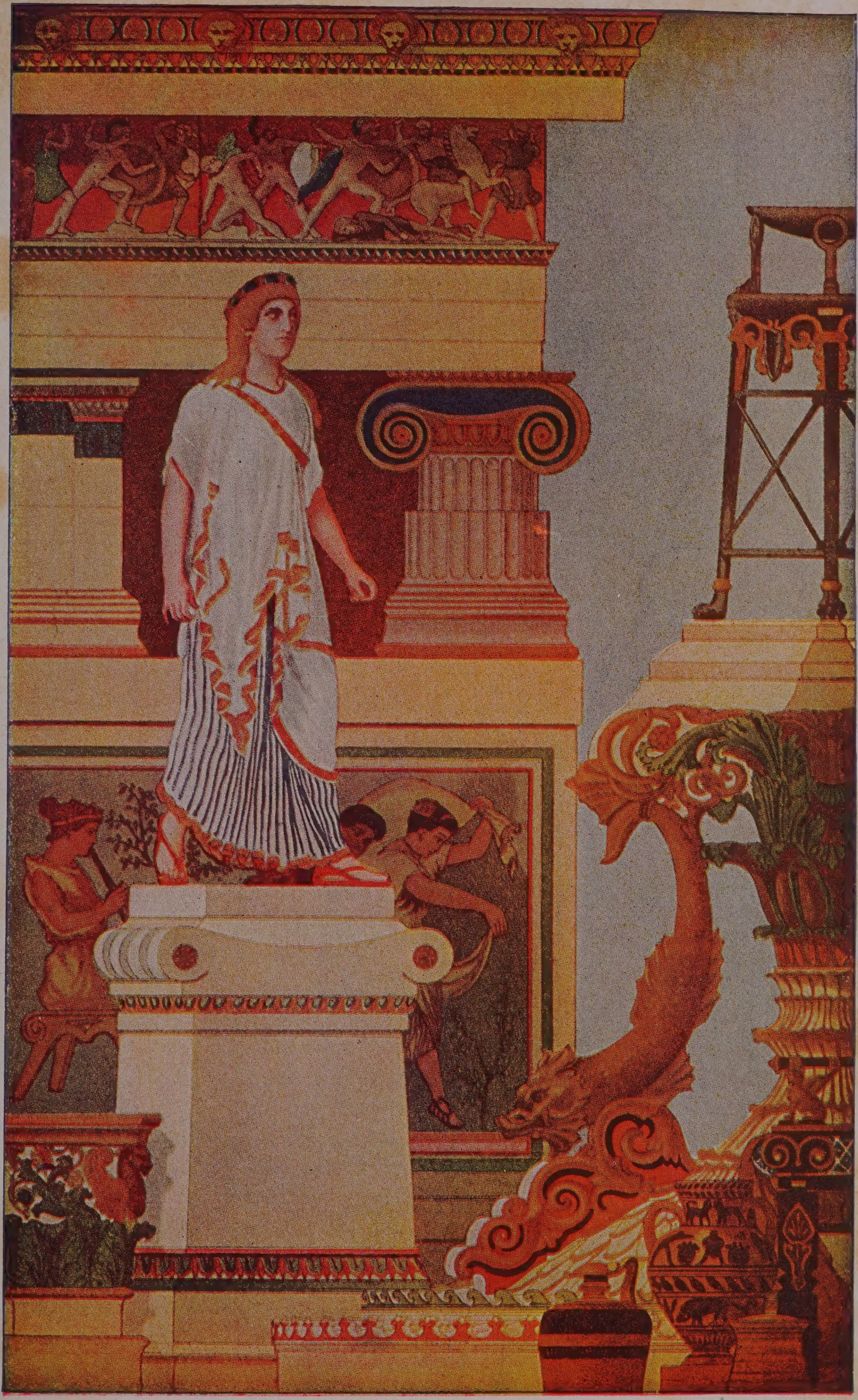
Wood-block printing in black and white had been practiced in China for many centuries in the printing of the text and in the illustration of books, and it was in that way that it was first used in Japan. In the earlier stages of the art color-pictures were printed in outline and then colored by hand. Gradually the process became perfected, until it was possible to print most delicate and intricate designs and get any desired effect. The great works in Japanese color-printing were nearly all produced between about 1680 and 1850, since which time the art has been in its decline.

A few of the great print-artists in chronological order are Hishikawa Moronobu, Suzuki Harunobu, Katsukawa Shunsho, Torii Kiyonaga, Utamaro, Utagawa Toyokuni, Hokusai, Shunsen, Kunisada and Hiroshige. The most universal genius of them all, no doubt, was Hokusai, who at once was a painter, designer and print-artist. He, more than any of the other of these craftsmen, is recognized by his countrymen, who, however, never could quite forgive him for the vulgarity of the subjects he chose to paint. Hiroshige is famous for his landscapes. Excepting Hokusai, he was the only one of the print-artists who treated the landscape in any other way than as an accessory for their figures. See E. F. Strange: *Japanese Illustration* and William Anderson: *Japanese Wood-Engraving.*

Chinese Painting. Chinese pictorial art, when compared with that of Egypt, is modern, whereas in relation to Japanese painting it is quite ancient. There seems to be no trace of any native Chinese art of this kind previous to the time of the introduction of Buddhism into China, whither it came from India during the reign of Emperor Ming in 62 A. D. There are records, between that time and the seventh century, of paintings of dragons and of Buddhist gods and goddesses that were made for the decoration of temples. In the eighth century there were two famous painters who were employed to do some decorative work for the government. The Sung dynasty between 960 and 1206 had many painters, among whom were Li Lung-yen (or Ri-riu-min as the Japanese know him) and Ngan Hwui (or Ganku in Japanese). The former was famous for his Buddhist pictures, his drawings of landscapes, horses and the figure. He is represented in the British Museum by a painting called *The Nirvana of Sakyamuni.* The latter was known as the last of the great masters who so strongly influenced Japanese painting. The Yüen dynasty between 1206 and 1450 had some noted painters of horses, tigers and birds, the most famous of which perhaps, was Chao Meng-fu whom the Japanese call Cho-su-go. The Ming dynasty between 1450 and 1628, like the Yüen, shows almost an absence of religious paintings, but many landscapes, birds, flowers, animals and figures.

In China, painting was a direct outgrowth of writing. For centuries the greatest admiration was felt for the ability to write beautifully; and to write Chinese is to be able to control the brush to a degree that is impossible to an occidental. In learning to write, the Chinese learn to master the mechanical part of the painter's art, and it only remains for him to draw objects instead of the characters of writing.

The Chinese painter cares little about representing things as they look in the truth of light and shade, perspective, etc., but tested his work by the character, directness and vigor of the lines used. There were three ways of painting: by the use of line alone; by the use of line and mass in monochrome; and by the combination of line and color. The Chinese painted both on paper and on silk, on which they used either ink or an opaque



GREEK ART

water-color of very durable quality. The Chinese painter applied his art to such crafts as wood-engraving, decoration of pottery, lacquer and embroidery.

While the painting and sculpture of China furnished the inspiration of those arts in Japan, they never reached the high state of development that they did in the latter country. Literature, to the Chinese, seems to be the more natural medium of aesthetic expression. See William Anderson: *Catalogue of Chinese and Japanese Pictorial Art.*

EMMA M. CHURCH.

EGYPTIAN ART

Egyptian Wall-Painting. Egyptian wall-painting is symbolical and decorative. Its first object was to tell the story of the king's life, public and domestic, his battles, triumphs, religious ceremonies and sacrifices and festivals. He was believed to be a relative of the gods, and therefore received devout tribute and praise from his loyal underlings. He made the laws, was the judge and declared war; in fact, everything was under his control.

Secondly, this painting was to decorate the wall-surface. It was always flat, never giving the effect of light and shade and never showing any perspective. The face of a human being was always painted in profile, while the shoulders were drawn in full front-view; and, again, the body was so twisted that the legs and feet were in profile. The feet and hands were always drawn flat. The drawing of the lower animals shows much more truth in portrayal. In most cases the artists caught the characteristic movements. In depicting landscapes the surface of their wall or paper was considered like a map, except that everything was drawn parallel to the picture-plane. Zigzag lines represented flat water, a tree a forest and a fortress a city. Flower-forms always were drawn generally and never in the particular (conventional as some may choose to term it), and used with great skill as decorative motives.

In composing, in order to make one figure the principal spot of interest, the artist drew it very much larger than all the rest. Hence we always find the kings like giants amongst pygmies when compared with their followers. The drawings were all made in outline and the enclosed spaces filled with bright color. The paintings were in most cases put upon the stone buildings, the pylons and the enclosing walls of the cities, temples, etc. Here the sculptor carved the outline in the stone, and then the color was applied to the drawing. The interiors of the tombs were always decorated in brilliant color, to brighten and enliven, and told the story of the deceased's domestic life. At first, in the painting, the story was merely told by the hieroglyphics with color painted into the cuts, but later these stories were illustrated with symbolic pictures and flat color, and later were drawn not only upon stone but on various materials, as the wooden lids of mummy-chests, papyrus, etc., with an outline of black chalk or coal; and finally the bounded space was filled with color mixed with gum-water. See, also, PYRAMIDS; TEMPLE OF LUXOR; TEMPLE OF KARNAK; SPHINX and RAMESSION.

ASSYRIAN ART

Architecture. Assyrian architecture is so closely allied with that of Chaldea or Babylonia that it is difficult to separate them. We might consider the two in one great style, as it is only by comparing the ruins of one with those of the other that we can make any headway in our study.

The Chaldeans in the valley of the Tigris and Euphrates, being overthrown by an invasion from the west in 1518 B. C., gave the Assyrians a chance to rise to supremacy and in 1273 B. C. they founded the great kingdom of Nineveh which held the ruling power for six and one half centuries in Asia.

The ruins of the buildings of these people are little more than undiscernible heaps of clay, except those found at Persepolis which are fairly well-preserved. Their almost complete destruction is due to the lack of any natural, durable material and to the lack of fuel which made fired brick very costly. Wood and stone had to be carried long distances, and therefore were very expensive and usually used only for ornamentation. Hence we find little refinement of form, no system of colonnades, no overhanging cornices or the like. Sun-dried bricks of clay, made of the viscous, adhesive soil, in blocks 12 x 12 x 2 or 4 inches were the most usual building-material. These bricks were often put into the building wet from the molds, and allowed to bake in the structure. Sometimes lime and mortar were used as adhesives, but usually only bitumen.

The most important and distinguishing feature of this early architecture of Assyria is the wagon-vault or tunnel-vault, a prolonged arch of sun-dried bricks, raised obliquely from the walls and used to roof long halls, rooms, sewers and drains. In the rooms at brief intervals there were higher vaults for the admitting of light and air, shaped like semidomes. Fire-brick was used as an inner facing in the drains.

Columns were not commonly used, though sometimes they are found constructed of brick or sections of sun-dried clay. Galleries raised on columns for the admitting of light have been discovered.

The most important buildings were palaces, hanging gardens and temples. No tombs have been discovered, unless it be the pyramid of Nimrud, a massive structure without stairs or inclined plane, but nothing certain is known about its use.

The Assyrian structures were built upon terraces or in the form of terraces to which flights of steps or long, gradual slopes gave access. The walls were unbroken, except by towers where defense was necessary, and of uniform height. The temple terraces were of many colors according to their religious symbolism.

Sculpture. Assyrian sculpture was decorative and in most instances done in bas-relief. The artists show great freedom of method, but were bound to certain conventions by religion and royalty; hence there is little poetry in their work. The Assyrians seldom departed from incidents in their religion and in the life of their king. The sculptor was the historian and pictured the king, who is rarely seen alone, in his victories, triumphs and hunting trips. In this sculptured history the king is shown leading the procession of warriors followed by the priests, judges, common people, horses, etc.

The sculptor uses one type of man throughout, the king being recognized only by his curled hair and beard, high tiara and costly attire. In the same way his followers are known by their dress.

Above the kings are the composite beings with human features, signifying intellect, and body and wings, types of brute-life, signifying power and strength. The most common of these creatures were the winged bulls, having human faces with curled hair and beards and wearing high tiaras topped by a crest of feathers. There were others, gods represented by combination of parts of various birds and animals, but nearly always having the faces of human beings. There also were evil spirits which were always hideous assemblages of the lower forms of life.

Sculpturing in the round was usually employed to represent the gods only, although in rare instances the king is so modeled, when he is walking alone.

The lower animals were always a source of inspiration to the Assyrian artist, who carved and chiseled them with a truth and precision that are surprising when we compare them with their study of the human figure.

Assyrian sculpture was done for the most part on slabs of soft alabaster and limestone, and was in nearly every case used for interior decoration. Sculpture in Assyria was cut short in its development by wars, so that no rise and decadence are shown, but rather a slow but steady progression.

Pottery. The Assyrians were well-advanced in the art of making pottery, as clay was their chief material for artistic expression. Brick-making may be classed under this head, (see ARCHITECTURE). The bricks were large, usually square and of two kinds, sun-dried and fire-baked, the former being used mostly for heavy building, while the latter usually were applied as decoration. These fire-baked bricks were frequently covered with brilliant colors and enameled with copper. Flowers, rosettes, palmettes, chain-patterns, subjects of the chase, men, animals and trees were painted into the enamels, and each brick bore the name of the king.

The literary productions of the land were inscribed upon bricks, tablets, vases, etc., and collected in large libraries. Many of these records are in existence to-day and fairly well-preserved. They are written in cuneiform, and contain valuable writings and accounts of the life of the people, verifying many of the stories of the Bible.

Few vases are found, except large urns that were commonly used for coffins.

Painting. Very little is known of the painting of Assyria, but traces of color have been found on the bas-reliefs, wall-decorations and terraces. In the latter each terrace was painted a different color, according to the phase of worship to which it was devoted. Pins of clay were pressed into the interior walls of buildings while they were still soft, forming interesting design-arrangements, and then colored in various schemes. This shows that the art of painting was not entirely unknown, but the perfection that it attained can only be guessed at.

GREEK ART

Sculpture and Pottery. The period of primitive sculpture in Greece was previous to 1000 B. C. In the Mycenæan age the temple-decoration depended upon fresco-painting and incised cement floors, and there was very little sculpture. The gate of the citadel at Mycenæ (1500 B. C.) displays a relief of two lionesses with their forepaws resting upon an altar. Dignity and power are expressed in every line of their angular bodies, and one turns from the contemplation of the woolly manes and lashing tails of modern forms, to these simple, archaic beasts with keen delight. Mycenæan pottery was the leading lucrative form of modelling. It was so varied and attractive that desire for pottery was stimulated. When Athens and Corinth became rivals in this industry, Greek wares migrated all over Italy as well as the Orient. The Greek vase illustrates the history of the country a thousand years previous to an authentic written word. The designs were first marine and then geometric, and the colors lustrous reds, blacks and browns. Mythological subjects predominate, and the religious teaching of vase-pictures from the first to the last chapter of Greek theology is incalculable. The majority of vases were adapted to household needs such as the amphoræ for storage; the hydria for drawing and carrying; the lekythos for pouring; and the kantharos for drinking. Primitive sculptures at Selinus interpret the Greek idea of strength in short legs, thick bodies and exaggerated muscles. A perpetual smirk, supposed to indicate joy, is found on the round faces with their bulging eyeballs and spiral twists of hair.

The transitional period is illuminated by such productions as Myron's *Discobolus* and the pediments at Olympia. The *Discobolus* is a bronze of a young Greek throwing the disc. In the face and form we have the generalized type of masculine beauty and grace which had reached its height at that period. The art of Myron was not obscured by that of Pheidias, for the sequence of productions in Greece flows on like a splendid river, where each bend or turn lends a charm all its own.

The architectural feature of the age of Pheidias was the Parthenon, the Doric temple of Athene, the patron goddess of Athens, as well as the treasury of Athens. It was the background for the most important group of sculpture the world has known.

The Panathenaic (all-Athens) procession was a celebration of civic pride, combined with religious sentiment. Therefore, it was logical that Pheidias should choose the subject of this procession for the magnificent sculptured frieze within the portico. The exquisite grace of the maidens who lead the van, the spirited steeds and athletic figures of the young men, the whole play and movement of this wonderful presentation in marble are indescribable. The remnants of the frieze and fragments of two splendid pediments are housed in the British Museum, but only a supposed model, combined with historic descriptions, suggests the beauty and grandeur of a statue once within the building.

This figure of Athene was thirty-nine feet in height and of wood and stucco. The flesh-parts were covered with ivory, with eyes of painted marble to imitate nature. The hair and draperies were of solid plates of gold, so made as to be removable in case of war and yet leave the figure uninjured. It is said that eight statues of Athene were executed by Pheidias, as well as the colossal figure of Zeus at Olympia.

Writers declare that in this last work the sculptor reached the climax of portraying divine excellence, serenity and joy. The ruling power with Pheidias was the ideal; with Polykleitos the sublimest beauty is the real, but in Praxiteles we find the sculptor of gods, not men.

In a room at Olympia, especially designed for its occupancy, stands the *Hermes* of Praxiteles, the most beautiful of marbles. The smile of the mobile mouth is as gentle, the curling locks as crisp, as when the master sculptor gave the last touch to that serene brow. To see it is to know that the essence of divinity has manifested itself in a materialized thought.

The important sculptures of the Hellenistic period were the figurines in terra-cotta found at Tanagra and three statues in marble. These three matchless works are the *Apollo Belvedere* in the Vatican; the *Venus of Melos;* and the *Victory of Samothrace* in the Louvre. The last is the most interesting of all, for, headless and armless though she is and though poised at the top of a flight of stairs instead of upon the prow of a ship, she seems to rush onward, her vibrant wings spread to meet a fresh sea-breeze. See A. S. Murray: *History of Greek Sculpture;* F. B. Tarbell: *History of Greek Art;* and J. H. Huddilston: *Greek Pottery.*

Gothic Architecture and Sculpture. Greek temples are beautiful without, Moorish mosques within, but the Gothic building is beautiful both within and without. It stands as an expression of the freedom of thought between feudalism and the crusades. It was the result of the brotherhood of Masons, who. together with the clerical authorities. desired to build royal monuments to the living and ever-present God. Because of this the great Gothic cathedrals have eternal youth. "Gothic implies a building in which stone vaults are supported by a framework of independent ribs." This skeleton is supported vertically by heavy piers. and the combination is prevented from falling in or out by thrusts in the shape of arches and buttresses, that distribute the weight of the vaults and ribs.

Walls proper scarcely exist, because the usual wall-space is occupied by enormous windows above the ground-story of the exterior and within by colonnades. Huge outer abutments are the bases for what are called the flying buttresses. These are a form of arch which rests at one end on an outer pier, while the other presses against the upper or clerestory. The flying buttress, the skeleton-framework and the prolific use of the vertical line are the characteristic features of Gothic art. Among the most important examples are the French cathedrals of Chartres, Amiens, Beauvais, Rheims and Notre Dame de Paris; the English cathedrals of Lincoln, York, Winchester and Canterbury; the German cathedrals of Cologne and Strassburg; and the Italian Duomo at Milan.

The notable feature of the perfected Gothic, which is found in France, is its adherence to fixed structural laws. In the other countries features have been added that are neither useful nor more beautiful than the French plan, but lend a local touch to the edifice.

The square east end of the building and the lancet. decorated and perpendicular styles of windows are peculiarities of English Gothic. Moreover, some of the churches have timber-ceilings instead of stone-vaults. Another innovation is called stellar vaulting, when the ribs are so numerous and so arranged as to form a star.

It is said that the towers of Chartres, the nave of Amiens, the choir of Beauvais and the doors of Rheims would make a perfect building.

Gothic sculptures are at their best in France, where unity of style is essential. Not only are the sculptures plastic histories, but the manner of handling the figures corresponds with the adjacent lines, angles and curves of the building on which they are placed. Thus the realistic gives place to the harmonic. The lines on the male figures are often so elongated, in order to express dignity and to harmonize with the surrounding, as to lose in beauty when judged as a single work of art; but, as only a unit in the whole building and seen from a little distance, the perfection of taste displayed is obvious.

The typical motive in English and German decoration is the leaf-form. This grew from the trefoil or three-lobed grape-leaf (emblem of Christ) to naturalistic copies of oak, maple, lettuce, carrot-leaves and fruit. Leaves in flame-shapes to correspond with the flamboyant style in building were found on English structures, and nothing could be more charming than the foliage carved in the stone of Strassburg.

Gothic design prevails in all European wood-carving as well as in the productions of metal-workers. Grotesque sculpture, as expressed in the gargoyles (rain-spouts) of cathedrals and in freakish heads of men and beasts, as illustrated in the numbers that fairly ripple over the walls of Rheims, are to be taken seriously when their symbolic meaning is understood, for they are supposed to represent the various forms adopted by the Satanic horde when expelled from the sacred precinct by the heavenly host. See *Cathedral Cities of France* by H. M. Marshall; *The Cathedrals of England* by F. F. Bumpus; *Gothic Architecture* by Francis Bond; and *Great Cathedrals* by E. A. Brown.

BYZANTINE ART

Architecture, Sculpture and Painting. Byzantine architecture which is sometimes called eastern Romanesque, like the western Romanesque was a further development of the older Roman style. The geographical position of Byzantium, being the same as that of the modern city of Constantinople, made commercial communication with the east both natural and easy, and this was the means of bringing the art and culture of the orient to the notice of the western world and the reason that we find in Byzantine architecture the fusion of the structural and decorative characteristics of both Rome and Asia Minor and the far east. From Rome the Byzantines borrowed the use of heavy buttressing, either on the inside or the outside of buildings, the use of monolithic columns and the incrustation of walls and piers with panels of marble and rich decoration of mosaic. From the east they obtained the idea of their vaulting and the style and treatment of their design.

The most characteristic feature of Byzantine building is the prevalent use of the dome and the construction of the dome on what are known as pendentives, which made it possible to surmount a building having a square ground plan, with a circular dome.

This may be more easily understood, if we can imagine a large hemisphere resting on four piers or vertical supports, then supposing that four vertical sections, in the same plane with the sides of the square made by the four piers, are cut in the hemisphere, leaving four semicircular arches, one spanning each pair of piers. Then we may imagine a horizontal section cut from the top of the hemisphere, leaving triangular sections of a sphere between the four arches and the horizontal section, which are the pendentives. Sometimes a hemispherical dome rested directly upon this horizontal opening but in later buildings a cylindric crown was built around it, in which windows were made, and on this crown was placed the final dome.

Byzantine buildings were almost exclusively ecclesiastical in character, and made use of a wide variety of ground-plan, such as the circular, octagonal, Greek cross and oblong.

The exterior of the buildings was severely plain, having only bands of a lighter or darker marble to mark the stories of the structure, but the interiors were very rich in colored decoration in painting and mosaic as well as in sculptured design. The painted decoration was used in the smaller buildings, while in the larger ones is found most gorgeous embellishment of mosaic in the richest of color and gold, in which were depicted biblical scenes, saints and symbolic figures. Set patterns, monograms, crosses and other symbolic geometric forms were also wrought with great beauty. As early as the 5th and 6th centuries the Byzantines had developed a beautiful and individual style of sculptured decoration, which was usually in very low relief and gave a lacelike and charming effect to surfaces. The acanthus and anthemion were the most common forms used in carved decoration, but they were treated in a new and individual way.

The greatest monument of Byzantine architecture and one of the masterpieces of building of the world is the Hagia Sophia, which was originally a Christian church built in 532 A. D. by Justinian, but which is now a Mohammedan mosque in Constantinople. In Constantinople, also, is located St. Sergius, another example of Byzantine architecture. This building, like San Vitale in Ravenna, has an octagonal ground-plan and is surmounted with a dome.

Byzantine art spread its influence far and wide and until the 12th century and, in some places, until much later, it dominated the art of the Christian world. In Venice is an example of this influence in St. Mark's. In Russia, where we find the fantastic bulbous dome, and in Greece the Byzantine style of building has remained the approved style of the Greek Catholic church. There are buildings of this type in Greece, on Mt. Athos and in Athens. Probably the most marked influence it has exerted is on Mohammedan architecture even to the present time. See *Hamlin's History of Architecture.*

ITALIAN ART

In Italy have arisen and developed three successive styles of architecture, namely, the Roman, the Byzantine and the western Romanesque. Each of these has produced its own distinct type of decorative painting and sculpture. We have treated Byzantine art under a separate head. Italian painting and sculpture, which belong more particularly to the last named style of architecture, will be dealt with in detail in the biographies of the artists of the renaissance, which is said to begin with the work of Cimabue, who is called "the father of modern painting," in the 13th century.

Cimabue and especially his pupil and successor, Giotto, tried to break away from the traditions of the church that had fettered the Byzantine painters and sculptors; and they gradually grew toward a representation of the human figure that had grace and beauty as well as more truth of drawing.

There were two great centers of culture and art that produced the majority and the greatest of the Italian masters. These centers were Florence and Venice. The Florentine school comprised such artists as Cimabue, Giotto, Masaccio, Fra Angelico, Botticelli, Raphael, Lionardo da Vinci and Michael Angelo. The Venetian school claims the two Bellini, Titian, Veronese and Tintoretto. Montegna came from Padua, Corregio from Parma, and Perugino with a group of students makes up the Umbrian school.

Venetian Architecture. Situated halfway between the Byzantine and Franconian empires, Venice became the market-city of exchange between two powers. Artists from the east and west were drawn to this great bazaar and native workers accompanied the ships that pillaged oriental cities of materials and ideas. The Venetian artisan was clever enough to learn the secrets of many trades, and imitated them,—to the gain of decorative Venice. The architects and builders had not the severe and practical training of the Pisan and Florentine. There was no internal warfare in the republic, and therefore no need of household fortresses. Therefore the Venetian seized upon the picturesque and fantastic styles in others, and grafted them upon a building suited to his needs. For instance: Venetian palaces face canals; some on cross-intersections of waterways: therefore angle-windows were introduced, that the owner might have two views. These were faulty in construction,—but how convenient! The useless screen over *Ponte del Paradiso* would be ridiculous, if it were not a gem of the sculptor's chisel. A lack of coherence is one of the marked demerits in Venetian building, although that is balanced by a keen sense of the picturesque.

Among the most important examples are the Byzantine cathedral of St. Mark; the Gothic palace of the doges; and the renaissance church of S. Maria dei Miracoli, where the evolution in type of construction is seen. St. Mark's, Venice, with its oriental columns, its sculptures, bronzes and mosaics, is a museum as well as a church, for here are found the spoils of battle as well as the symbols of peace. The mosaics are set to show a tiny rim of plaster; this opaque rim of white, combined with the bits of gold and colored glass, produces a glow upon the walls that is matchless.

The two lower arcades of the doges' palace are among the best in Europe, but the building is badly marred, because the third story, planned to rest on the back of the upper arcade, was brought forward flush with its front edge. The marble facing, however, of this despised third story is built into the wall, instead of being stuck on, as was usual elsewhere. The sixteenth-century library, built by Sansovino, with its double colonnade of open arches and embedded columns, is one of the finest secular buildings in Europe.

This edifice, with the cathedral and the ducal palace, forms a noble group about that heart of Venice, the Square of St. Mark. From the water-gate of this square Palladio's Campanile of San Giorgio cleaves the sky and is a bright foil to the great dome of S. Maria della Salute.

We embark and glide down the Grand Canal, with "glorified streets" in the form of bridges and lined with old palaces, showing the same fine distinction of style in Gothic or Renaissance, as their owners in family and position, and then the eye falls on one of consummate grace; so satisfying is it to a lover of pure beauty, that one knows instinctively that he looks upon

Casa d'Oro the Golden House of Venice. See *Stones of Venice* by John Ruskin; *Venice* by Molmenti; and *Venice* by F. Hopkinson Smith.

GERMAN ART. Romanism ploughed its way across Germany at an early period, with the result that by the tenth century a large number of wealthy monastic buildings were established on or near the Rhine and Danube Rivers. However, no churches of great importance were erected before the eleventh century, excepting the octagon of Charlemagne at Aix-la-Chapelle and the Romanesque cathedral at Bamberg. The monks in the aforesaid monasteries painted exquisitely on parchment, and produced some interesting pottery and glassware. It was not until late in the thirteenth century that Gothic art in its perfected form appeared, and culminated in Cologne cathedral. The Saxon city of Dresden was the cradle of Rococo art with the Zwinger building as an illustration of this period in its most exaggerated or baroque style. By way of the Meissen potteries, in the neighborhood of Dresden, the rococo garlands and scrolls, as painted on china, migrated from country to country and became a familiar and popular type of decoration. Berlin is the center of huge government and private palaces where the work of the distinguished architect Schinkel has been enthroned. Yet neither city could command the same unqualified approval from art-critics in general as the old town of Nuremberg, with its lofty dwellings peppered with quaint gable-windows, and the possession of that group of men known as the Little Masters.

To understand German stonecutting, one should study the carvings on the church of St. Sebaldus, Nuremberg, executed in the fifteenth century by Adam Krafft. To appreciate something of the endless and minute labor expended upon a single monument, days should be spent in examining the bronze shrine of the saint within the church, the work of Peter Vischer and his five sons, who were thirteen years modelling it. A crucifix and several large reliefs in the choir by Veit Stoss exhibit master-carving in wood, which is one of the leading German crafts. The greatest of German artists, of the Nuremberg masters, was Albrecht Dürer (1471–1528) painter, engraver and goldsmith, whose nobility of character and versatility of talent place him on a pedestal of fame that will never topple over. The two Holbeins rank next in importance to Dürer; Hans Holbein, court-painter to Henry VIII, was a strong technician and a fertile inventor. His pictures of home-life are charming and versatile.

Among the modern masters of Germany are Schwanthaler (sculptor) and Cornelius, Overbeck, Von Kaulbach and Richter (painters), who were the proteges of kings and the idols of the people. The heroic bronze figure of Bavaria by Schwanthaler is a metal epic that dominates Munich, now the art-center of the empire. Cornelius and Von Kaulbach have executed important modern wall-decorations, and Overbeck's group of large engravings of the *Life of Christ* is a national treasure. No pictures of children's faces are purer or sweeter than the lovely composition known as the *Song on Christmas-Eve* by Ludwig Richter. A new school called the Sessionists has sprung into being and met support, and Franz Stück has been the leading spirit. See *History of Art* by Lübke; *Gems of Modern German Art* by Scott; *Northern and Southern Germany* by Baedeker.

RUSSIAN ART

The churches of Russia, as well as some of the palaces, are stamped with Byzantine design, mingled with an exuberant local feeling that is barbarous, without being effective from a truly artistic viewpoint. At a distance the numerous highly colored and gilded cupolas, domes, spires and other bulbous projections, which are heaped upon one building, lend it the form of a vegetable bouquet. However, taken singly, nearly every one of the turnip, carrot or onion-shaped domes or towers, with its gilded or colored surface, is intensely interesting. There is a general disposition to build the central dome or tower unbroken from within, so that the wall-paintings of enormous figures may be carried up the funnel-shaped openings from above the congregation to the top. A succession of granite steps leads to the pompous portals, thus adding to the grandeur and solemnity desired by the builders. High, dark arches gleaming with antique gold spread like bats' wings above the many shrines which are spangled by ever-burning lamps. A huge iconastos or screen, composed of holy pictures, separates the congregation from the priests who may be seen officiating at the altars through doors in this screen. Innumerable icons are hung about the church with racks for candles. These sacred pictures are modeled after the ancient icons painted by Rublof, a monk of the fourteenth century. The pinched, wan faces are supposed to inculcate habits of piety and temperance. The faces and hands are painted, and the hair and clothing are composed of etched metal-plates. Every room in every building, from the palace to the tavern, has its icon, which is placed in a corner directly beneath the ceiling.

The most interesting examples of architecture in Russia are the buildings included in the Kremlin or Citadel of Moscow, the cathedral of St. Isaac and the Peterhof at Petrograd and St. Sophie at Kief. The royal palace of Peterhof is situated on a hill which is a cascade of buildings, trees, fountains and flowers. Peterhof is a weak imitation of Versailles, and everything that could be gilded glitters and sparkles with the brightest of gold. Russia boasts one of the finest collections of art-works, installed in the Hermitage, and her painters are prominent exhibitors at the various salons of the world.

Among the notables are Répine, Aivazovski, Siemiradski, Makovski, Volkoff, Peroff and Verestchagin. Everyone who attended the Columbian Exposition will remember the *Russian Wedding-Feast* by Makovski, and Vasili Verestchagin's great battle-scenes are familiar to many Americans. No painter has accomplished so much to tear the veil of glamour from the awful face of war as this apostle of peace. We understand something of the dense forests, wide marshes and desolate coasts of this distant country, when we stand before the canvases of Volkoff, and we appreciate more the mingled pride and cruelty of the early rulers when studying Répine's marvelous rendering of that last scene between Ivan the Terrible and his son. See *The Tsar and his People* by Eugène de Vogüé; *Russian Art* by Alfred Maskell; *Studies in Russia* by J. C. Hare; and *Russian Art* by Viollet-le-Duc.

SCANDINAVIAN ART

Northern Europe is noted for its love of rugged outlines and bold, pure color. These traits are manifested in Norway and Sweden, where cliff and precipice reign permanently and the skies change from clear bright blue to stormy black. Denmark is a charming foil; here all is gentle and undulating, and the predominating color is a misty gray. Norway contains a number of very old timber-churches with lean-to roofs above building and porch and but four small windows. The interiors are lighted by lamps which give additional warmth. The houses of the nobility in Norway and Sweden are composed of huge timbers with plastered walls, which are painted in many colors. The elaborate dadoes and doors of the Crown-Prince's palace at Stockholm are typical of the national spirit in decoration. In Westgötland, Sweden, there is a castle where the arms of the family, accompanied by huge scrolls, are arranged about the main portal like a pyramid. The scroll and the dragon design are the two principal motives in Scandinavia, and are turned and twisted in every conceivable way. Inlaid wood is one of the arts, and may be seen at its best in some exquisite panels in the palace at Kalmar. The wainscoting of the Golden Hall in this huge quadrangular edifice is worth much to the student of design. Baroque architecture seems to have reached its height in Denmark, where dropsical figures are arranged about the doors and windows or sport as goddesses on ceiling-decorations. Bertel Thorwaldsen, whose grave is found in the court of the massive building where his sculptures are exhibited, was the leading sculptor of the nineteenth century. His love of Greek art gave his work a repose which had been entirely lost in the exaggerated style of the Rococo.

Danish painting is homely and precise, as one sees it in the productions of Eckersberg, in Vermehren's charming cottage homes, in Viggo Johansen's captured moments of real life. The historical painter, Christian Zahrtmann, searches for spiritual feeling and expression, and Kröyer paints the wooded coasts in soft bluish-grays indescribably Danish.

Since 1860, in Norway, great interest has been manifested in the promotion of a national art, and the typical men who paint in a rough, angular but healthy and frank manner have made themselves felt. We hear most of Wenzel Jörgensen, Kolstoe and Krohg, painters of fisher-folk, and ot Fritz Thaulow, whose glitter of ice and snow and little red houses at Christiania are so delightfully familiar and homelike.

Swedish artists are the Frenchmen of the North. They paint with grace and spirit. Stockholm possesses several historical canvases by Roslin, who lived in Paris in princely style. The Swedish painter of painters is F. J. Hoeckert. The museum of Lille owns his masterpiece, *Divine Service in Lapland.* The ultra-modern Anders Zorn, who has painted many portraits of distinguished Americans, is best known here. His manner of handling the brush is independent and bold, and his perception of character and temperament is as keen as discreet. See *Dictionary of Architecture* by Russell Sturgis; *History of Modern Painting* by Müther; and *Norway, Sweden and Denmark* by Baedeker. A. S. HALL.

See, as representatives of French art, MILLET, COROT, MEISSONIER and others; of Dutch art, VAN DYCK, RUBENS, REMBRANDT; of English art, HOGARTH, GAINSBOROUGH, TURNER, MILLAIS and others; of American art, INNES, HUNT, WHISTLER, LAFARGE, SAINT GAUDENS and others.

Fin'gal's Cave, a cave or grotto on the island of Staffa, on the west coast of Scotland. It is probably named after Fingal, the Gaelic hero. The cave is 227 feet long and 42 feet broad at the entrance, and can be entered by small boats, the sea being 20 feet deep at low water in the cavern. It looks somewhat like a Gothic church, with its tall pillars and stalactites of many colors, and is one of the most picturesque grottoes known.

Fin'land (Swampyland or land of the Fens), was formerly a Grand Duchy of Russia but declared its independence following the Russian Revolution of 1917, as did the inhabitants of other vast areas of the former

Empire. The capital is Helsingfors. Area 125,689 sq. mi. Population 3,200,000.

The area of Finland is nearly 145,000 square miles, or rather larger than Great Britain and Ireland.

Surface. The country abounds in lakes, about a quarter of it being occupied by lakes or marshes, the largest being Lakes Ladoga, Saima, Enara, Kemi, Ulea and Päyänne. Lake Saima has an outlet into Lake Ladoga over the famous Imatra Falls, the finest in Europe, and is connected with the Gulf of Finland by a canal 36 miles long, which is considered a triumph of engineering skill, running through granite rock. Finland has no large mountains and only small rivers.

Natural Resources. Neither fossils nor coal are found, but there are remarkably fine quarries of granite and a large area of forest land. These give employment to over 21,000 timbermen and lumbermen. Of wild animals, there are bears, wolves, foxes, otters, hares and ermines; seals are plentiful along the coast; and reindeer thrive in the far north. Of birds there are 211 species, and in the rivers, lakes and seas are 80 known kinds of fish, including the salmon, trout, perch and pike.

Climate and Agriculture. The climate is severe in winter, 25° below zero frequently being registered; and the summer, though very short, is hot. Apples, pears and cherries are found below latitude 63°, and currants, raspberries and strawberries thrive everywhere. Of cereals, rye is the most known, then barley, oats and wheat.

Exports and Manufactures. Its chief exports embrace timber, paper, cardboard, leather, hides, tar, pitch, iron and iron products. Her manufactures give employment to over 100,000 workmen and yield an aggregate product (exclusive of four mills) of the value of 351,000,000 marks (about $71,000,000).

Government and Education. The country was formerly governed by the Czar as Grand Duke of Finland. There was a senate, nominated by the crown, presided over by a governor-general, which sat at the capital, Helsingfors (population, with Sveaborg, 200,000), and was the chief administrative body. Education is in a highly advanced state, no less than 91 per cent of the adult population being educated. There is a university with 1,092 students. The country is divided into 16 electoral districts. There are 2,012 miles of railroads, almost all belonging to the state. The army consists of 5,400 men in time of peace and about 20,000 reserves. There is only a commercial navy, numbering 357 steamers of 54,556 gross tons, and 2,536 sailing-vessels of 297,758 gross tons burden. The financial condition of the country is good, its public debt being more than offset by the value of the state property.

History. The people of Finland, called Finns, are related to the Laplanders and to the Magyars of Hungary, and are entirely different from the Swedes and Russians. They are mostly of native Finnish descent, intermingled with the Scandinavian races. They are an industrious and honest people, though not very intellectual; tall and well-proportioned, with rather square faces, and belong to the agricultural class. In early times they were known as pirates, and formed an independent empire. Their attacks on sea-vessels so annoyed other nations that the Swedes undertook a crusade against them in the 12th century, conquered them, and converted them to Christianity. Sweden kept possession of Finland until 1809, when it was conquered by Russia. Under Russian rule Finland rapidly became Russianized, and that in violation of the state constitution. In 1900 the Russian language became the sole official one; while Russia then insisted on legislating in Finland, in defiance of the local *diet*, in all matters affecting Russian interest. As a result there was much disturbance in the country, with several notable assassinations of Russian high officials, besides considerable emigration from it.

Finland, Gulf of, the eastern arm of the Baltic Sea. It receives the waters of the great lakes, Onega and Ladoga. Navigation is dangerous, on account of numerous islands and shoals.

Finns. See FINLAND.

Fir, a name applied to the true pines, larches and other small evergreens, more properly used to denominate the Norway spruce, the silver fir and their kind. There are about 12 species of the Norway spruce and about 25 or 30 of the silver fir. They are all evergreen-trees. The finest of European firs is the Norway spruce, which attains a height of from 80 to 150 feet. It yields resin, turpentine, tar and lampblack. In Sweden and Norway the inner bark is made into baskets, and the long, slender roots, after being boiled with alkali and sea-salt, are twisted into ropes. The wood is known in the market as the white Christiania deal and the Dantsic deal. Other well-known varieties are the black spruce, white spruce, red spruce and oriental fir. The hemlock spruce of North America is also well known. Its wood is not much prized, but the bark is valued for tanning. The Douglas fir attains a height of 250 feet, and forms immense forests in the northwest of America. The common silver-fir abounds upon the mountains of Central Europe and the north of Asia, and attains a height of 150 to 180 feet and an age of 300 years. It yields the clear turpentine known as Strassburg turpentine. The balm-of-Gilead fir is a native of North America, yielding Canada balsam. Spruce-beer is made from the small branches of the black spruce.

and the thread used by the Indians in sewing their birch-bark canoes is made from the roots of the white spruce.

Firdausi (*fēr-dōō'sē*), **Abul Kasim Mansur,** was the first and chief of modern Persian poets. The date of his birth is uncertain; he died in 1020 A. D. His great epic was the *Shāh Namāh* or Book of Kings, upon which he worked for 35 years. The poem traces the fortunes of Iran, even from the time of the legendary kings, including the great Jamshīd, who in the golden age reigned 500 years. The chronicle or, rather, epic closes with the fall of Persia before Islam. The poem was presented to Mahmud of Ghazni, but so petty was his reward that Firdausi wrote a bitter satire upon the monarch, and fled the country. A work of his old age is a poem upon Joseph and Potiphar's wife, as told in the *Koran.*

Fire-Damp is the miner's term applied to coal-gas when it issues from crevices in coal mines. The issue of the gas can sometimes be heard, and it can be lighted. When it has from a quarter to a sixteenth part of air, it will explode, producing disasters that are too well-known in the history of mines. The explosion stirs up the coal-dust, and as each particle is fired the result is like the firing of grains of gunpowder.

Fire-Engine, a machine for the purpose of throwing water to extinguish fires. Machines for this purpose were employed by the Romans, as Pliny speaks of them, and so does Hero of Alexandria. There are accounts of instruments for fires being used in Augsburg in 1581 and in Nuremberg in 1657. By 1730 Newsham, in London, had made successful fire-engines; the first used in the United States (in 1731) were of his make. The simplest engine consists of a force-pump and a cistern for water. In the larger engines there is no cistern; the suction-pipe is carried directly to the water-supply. The first fire-engine in which steam was used was that of Braithwaite in 1829; Ericsson made a similar one in New York in 1840. The heaviest American engine, with water in the boiler and men on the engine, weighs over five tons. Chemical fire-engines are used to extinguish fires in small spaces; they depend on the rapid production of carbonic-acid gas, which is an enemy to all kinds of combustion. See Roper's *Handbook of Modern Steam Fire-Engines.*

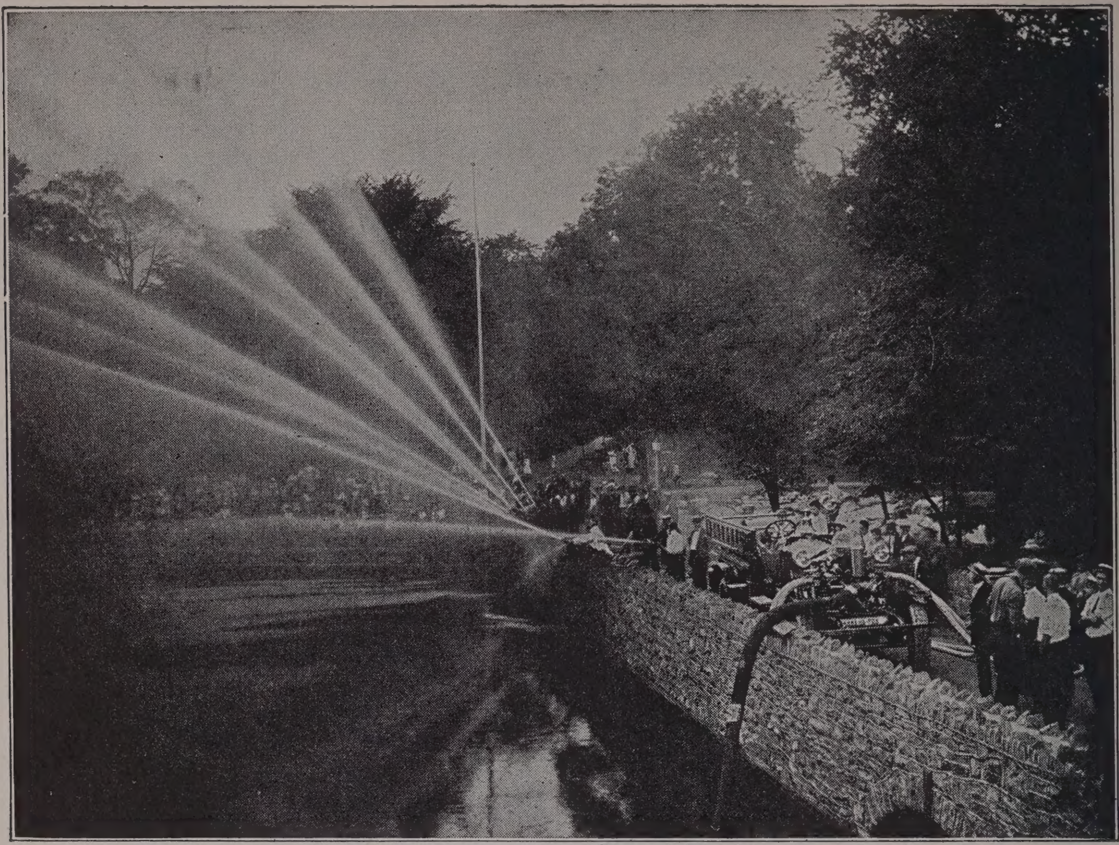
Fire-Extinguisher, a term generally applied to a number of chemical agents, which extinguish fires by forming carbonic-acid gas. Fire-extinguishers are so made that they may be carried on the back and their stream directed by the hand.

Fire'fly, an insect capable of emitting light from some part of its body. These insects light marshes and wet meadows, the banks of streams and ponds, and frequently are very abundant. Those of tropical countries are most brilliant. In tropical America several are confined in a cage to give light. For the most part they are soft-bodied beetles of small or medium size, and fly at night. The luminous spots are yellowish in daylight. These are located on several joints of the lower side of the abdomen, and are richly provided with air-tubes. It is believed that the bright light is due to oxidation of the contents of the cells in the luminous patches. At any rate, phosphorus has nothing to do with it. In the United States they usually are called lightning-bugs. In Europe there are certain kinds in which the female is without wings, and has luminous patches on the abdomen. These and larvæ that are luminous are called glow-worms.

Fire'proofing. The word fireproofing may mean the ways of so constructing buildings, safe-deposit vaults etc. as to make them capable of resisting the action of fire, or it may mean the coating of such combustible materials as wood and textile-fabrics, making them as fireproof as possible.

The means used to make buildings fireproof is, in general, to avoid as far as possible in their construction the use of combustible material, particularly wood; stone, brick, iron and cement being largely substituted for it. Of course most so-called fireproof constructions are only relatively so. If wood is carefully coated with a solution of silicate of soda, it will usually resist a high degree of heat without undergoing serious injury. A 20% solution of tungstite of soda is much used for making linen or cotton-materials fireproof. The textile is steeped in the solution and then dried. Different kinds of solution are used, varying with the different kinds of materials to be rendered fireproof. Some of the solutions used are apt partly to destroy the fabric. Fireproofing of this nature is extensively used for the canvas-material from which the stage-scenery used in theaters is constructed. If this scenery is not made fireproof, there is danger of great disaster, as theatrical contrivances are often such as easily to start a blaze. There are some paints that are claimed to make wood fireproof. These often contain sodium silicate and zinc chloride.

Fire'works. The art of making fireworks is called pyrotechny. They are made of some explosive material, of different colors and shapes, and used usually for amusement, though the rocket has been used for a signal in war. The powder generally used in fireworks is made on the same principle as gunpowder, and (besides the powder) niter, sulphur and charcoal are the main ingredients. Iron or steel-filings brighten the fire; zinc-filings give it a fine blue color; copper-filings give it a greenish tint. Yellow is produced by



Courtesy The Ahrens Fox Company, Cincinnati, Ohio

A modern 10,000 gallon engine being put through a test. Note the large number of columns of water being pumped by a single engine.

Courtesy The Seagrave Company, Columbus, Ohio

A SMALLER MOTOR ENGINE IN ACTION DURING A FIRE.

amber, resin and salt, and lampblack makes the fire red. Firecrackers, torpedoes, Roman candles, rockets, wheels etc. are among the common fireworks. The present form of fireworks, of course, does not go back of the invention of gunpowder; but the Chinese, who excel in the manufacture of them, had some form of them in use from an unknown period.

Fish-Culture. The importance of fishes as food has led to the formation of commissions by different governments for their care and spread. The culture and protection of certain kinds of fish was practiced as a private enterprise from 1750 onward, but the first public hatcheries were established in France in 1850. Soon after, in 1865, fish-hatching began in the United States, in New Hampshire, Vermont and Massachusetts. The United States now gives greater attention to the culture, propagation and spread of fishes than any other nation. A United States fish-commission was created in 1871, with Spencer F. Baird as fish commissioner. Attention was very early given to the propagation of shad, and the number of those fish greatly increased. In 1880 the rivers of Georgia were stocked with shad, and in the course of four or five years they were caught there in abundance. In 1890 the catch of shad along the Atlantic coast was two and one half times as large as in 1880. The government pays for the support of the United States fish-commission about $150,000 annually; and, in addition, more than 30 of our states support state fish-commissions.

The work of preserving and increasing our food-fishes consists in keeping the waters free from contamination by mills, sewage and other causes; in establishing laws to control the methods and seasons of fishing, in the cultivation of proper food-elements; and in the hatching and distribution of the young fish. Fish-breeding is practiced in many fish-hatcheries. The eggs are sometimes collected from the spawning-grounds; at other times fishes are obtained in a ripe condition and the eggs are pressed out by running the thumb along the under surface of the abdomen. The milt is then pressed out from the male fish and spread over the eggs. Thus they are artificially fertilized, and it is found that by this method a much higher percentage of the eggs is fertilized and developed than in the natural spawning-grounds. The eggs are now protected and reared in boxes and jars provided with running water. In some cases the young are fed by finely divided liver or other suitable food. After they reach a certain size, the young fish are shipped, and distributed in lakes, rivers and ponds. The United States government hatcheries yield over five billion eggs and young fish each year, and the states contribute about the same amount. Our supply has increased, and new kinds introduced into various sections of the country. Fishes have also been transported across the ocean; our trout have been carried to Japan and Great Britain, and we have received salmon and trout from Europe. Shad and striped bass have been carried from the eastern to the western districts, white-fish fry have been extensively planted in the great lakes, and the range of black and striped bass and other fish has been greatly extended. The extent of the work of distributing fish is great. Some of the states (Michigan, Wisconsin, New York, Pennsylvania) have distributed from 40,000,000 to 135,000,000 of fish in a single year. The term fish-culture and the work of the United States fish-commission have broadened to take in the protection and care of the seal-fisheries, of lobsters, oysters etc. See the various publications of the United States fish-commission.

Fish, Hamilton, American diplomatist, was born at New York on Aug. 3, 1808, graduated at Columbia College, and was admitted to the bar in 1830. He was a Whig in politics, was elected a congressman in 1842, lieutenant-governor of New York in 1847 and governor in 1848. In 1851 he was returned to the United States senate, and acted with the Republican party. From 1869 to 1877 he was secretary of state under Grant, signing, as one of the commissioners, the Washington treaty of 1871, which settled the Alabama question. He died at Garrison's, N. Y. on Sept. 7, 1893.

Fish'er, George Park, an American clergyman and church-historian, was born Aug. 10, 1827, at Wrentham, Mass. He graduated from Brown University in 1847 and, after a course of study in Germany, was made professor of divinity in Yale College in 1854 and of ecclesiastical history in 1861. Among his best-known writings are *History of the Reformation*, *Beginnings of Christianity*, *Grounds of Theistic and Christian Belief* and *Nature and Method of Revelation*.

Fisher, Admiral Sir John Arbuthnot, was born in 1841, entered the British navy in 1854, and took part in the capture of Canton and the Peiho forts in 1860. He served in the Crimean, Chinese and Egyptian Wars, commanding *The Inflexible* at the bombardment of Alexandria in 1882. He has successively occupied the following posts: Director of Naval-Ordnance (1886–91); Admiral-Superintendent of Portsmouth dockyard (1891); Lord of the Admiralty (1892–7); Commander-in-Chief on the North American and West Indies station (1897–9); delegate to the Hague peace-conference (1899); Commander-in-Chief on Mediterranean station (1899-1902); second Sea-Lord of the Admiralty (1902-3); Commander-in-Chief (1903-4); first Lord of the Admiralty (1904 to 1915). He died in 1920.

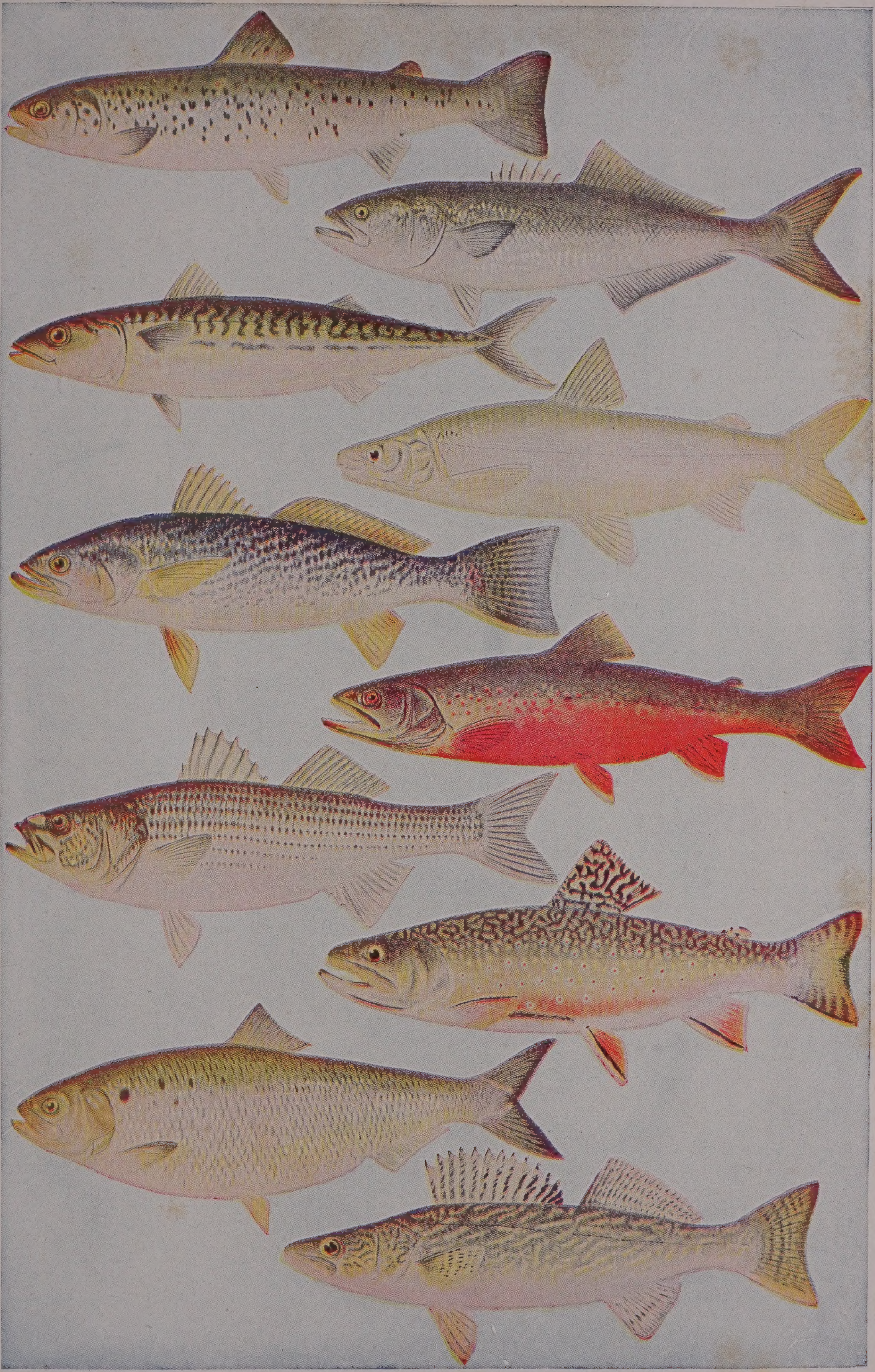
Fishes, aquatic vertebrates, breathing by gills. They are very numerous, and are of interest to the sportsman as game, to people in general as food and to the scientific student. Excluding the lancet and the *Cyclostomata* as below the true fishes, there are four orders left. 1. Bony or modern fishes (*Teleostei*). This is far the largest group, including most of the food and game fishes both in fresh and salt water, as cod, bass, perch, pike, trout, mackerel, etc. 2. Ganoid or ancient armored fishes (*Ganoidei*), including fishes with shiny hard scales, like the garpike, sturgeon, bowfin, etc. Representatives of this order are found as fossils in very ancient rocks, while the first order occurs as fossils only in relatively modern rocks. 3. Mudfishes, or double breathers (*Dipnoi*), including fishes that possess both gills and lungs, being the lowest vertebrates to have lungs. These first lungs are formed from the air-bladder, which is interesting, as it gives us a clue to the origin of lungs. These fishes live in the waters of Africa and Australia that dry up, and they form for themselves mud cases in which they live till the water returns again. The heart is imperfectly three-chambered, and by this and the possession of lungs they are closely allied to the *Amphibia.* 4. Cartilaginous fishes (*Elasmobranchii*), fishes with a cartilaginous skeleton and brain-case, instead of a bony one, including sharks, rays, skates, torpedoes, etc.

Fishes make a natural group or class. They have a two-chambered heart, consisting of an auricle and ventricle. They have gills and blood vessels running in the gill-arches that are called aortic arches—usually four or five in number. These run around the pharynx and unite above into the aorta or great artery. The blood is sent out from the heart to the gills; there it takes in oxygen and continues its circulation as arterial blood; and, passing through the capillaries of the body, it returns to the heart as venous blood. Fish have fins, supported by fin-rays, for swimming. Their colors vary, and often are brighter during the spawning season. Their food is diverse, many of them eating smaller fishes, crustacea and worms, while others feed upon plants; some few swallow mud for the sake of the organic matter contained in it. Their eggs are usually laid in immense numbers; for example, the whitefish or trout lays about 50,000 eggs in one season. Some forms, like sharks, lay few eggs, which are either retained within the body till hatched, or, in closely related species, are laid in the water, enveloped in a horny case. The horny cases of skates and sharks are called mermaid-purses. Some forms, like sticklebacks, build nests and care for the eggs until hatched. All fishes possess a set of sense-organs that are fitted to receive vibrations from the water, called the sense-organs of the lateral line. If any common fish be examined, there will be seen a line running on each side about the middle of the body. This is the position of the lateral line. These organs exist also in the tadpole stages of frogs and toads, but disappear when the animals leave the water, and are not present in land animals. Deep-sea explorations have brought to light many strange and curious fishes, some of them having luminous spots, from which light is emitted. See BLINDFISH, CARP, COD, GOLDFISH and others in alphabetical order. See Goode's *American Fishes;* Baskett's *The Story of the Fishes;* and Jordon's *Fishes* (1907).

Fishhawk or **Osprey,** a common well-known bird of eagle-like appearance, found in all countries, except Iceland and New Zealand. It is abundant in the United States along the Atlantic, and is also found inland in the vicinity of water. The American osprey is about two feet long; brownish above and whitish below; the upper part of the beak is strongly curved over the lower, and the claws are long and sharp, being especially formed for grasping. These birds feed exclusively on fish, and are expert fishers. They fly to and fro above the water and make a sudden dash after fish near the surface, sometimes going into the water to a depth of about one and one half feet. Their feathers are compact and oily, and do not become wet. The bald-headed eagle often chases the osprey, and robs it of its fish while in the air. In America the osprey nests on large trees, in Europe on rocky cliffs. The great nest is built of sticks, sea-weed and other material, and is used year after year. The two to four eggs vary in color, sometimes being white, again buff or chocolate. Ospreys mate for life, show much family affection, often make of the nest an all-year-home.

Fiske, John, an American author and historian, was born March 30, 1842, at Hartford, Conn. Graduating from Harvard in 1863, he became known as a deep thinker and forcible writer. In 1861 he made his mark with a notable critique on the fallacies in Buckle's history of English civilization. From 1869 to 1879 he was at Harvard, first as a brilliant lecturer on philosophy, then as assistant-libra-

JOHN FISKE



GROUP OF FISHES

Land-locked Salmon. Common Mackerel. Weak-fish. Striped Bass. Shad. Bluefish. White-fish. Canada Red Trout. Brook Trout. Wall-eyed Pike.

rian. The earlier recognition of him was chiefly of the expounder of evolutionary philosophy, and his lucidity in popularizing Spencer was admired by Darwin. After 1879 he devoted himself chiefly to American history, though his *Idea of God* (1885), *Origin of Evil* and *Through Nature to God* gave his last answers to questions in philosophy and religion. His histories extend from the earliest discoveries to the beginnings of Federal government; cover almost every phase of American life; and have dramatic interest as well as great historical value. As a lecturer and writer on philosophy and history, he took high rank among American authors, while he did much to elucidate and popularize the doctrine of evolution. Among his works are *The Destiny of Man; Outlines of Cosmic Philosophy; American Political Ideas; The Discovery of America; The Beginnings of New England; Civil Government in the United States; The American Revolution; Old Virginia and Her Neighbors;* and *The Dutch and Quaker Colonies in America.* He died at Gloucester, Mass., July 4, 1901.

Fiske, Minnie Maddern, born in New Orleans in 1865, is a well-known American actress of the realistic school. Like many other successful actresses, she spent even her childhood upon the stage. In 1890 she married Harrison Fiske. Some of her greatest successes have been made in *Becky Sharp*, in Ibsen's *A Doll's House* and in Hardy's *Tess of the D'Urbervilles.*

Fitch, John, inventor, was born in what is now South Windsor, Conn., in 1743, and is said to have committed suicide in the summer of 1798. In 1785 he completed his first model of a steamboat, which had wheels at the sides, replacing them in the following year with paddles. In the face of discouragement he built a vessel 45 feet long, which made a successful trial trip on the Delaware at Philadelphia, Aug. 22, 1787. A larger one was built in 1790, and attained a speed of eight miles an hour. Robert Fulton's steamboat was, in 1817, declared by a committee of the New York legislature to be "in substance the invention patented by John Fitch in 1791."

Fitch'burg, Mass., a city in Worcester County, Massachusetts, on Nookagee River. The city has grown a good deal during the last ten years. It has a well-equipped fire-department with over 75 telegraphic fire-alarm stations. The city has more than a score of churches and some 30 school-buildings, the latter valued at over $300,000. There also is a public-library and art-gallery building costing $90,000, given to the city by one of its public-spirited citizens, and $450,000 have been donated by another for a public hospital. The library contains close upon 30,000 volumes. There are many manufactories, the chief being paper-mills, machine-shops, iron-foundries, pianoforte, saw-factories, cotton, woolen and flour-mills, shoe and shirt-factories and bicycle, electrical apparatus and wood-turning establishments. Population 45,000.

Fitchett, Rev. William Henry, was educated at Melbourne University, has been president of the general conference of the Methodist church of Australasia, is principal of the Methodist Ladies' College at Melbourne, was former editor of the Melbourne *Daily Telegraph*, and is now in charge of the editorial interests of *The Southern Cross* and *Life.* He is even better known for his stirring recitals of British fighting on land and sea, his published works including *Deeds that Won the Empire, Fights for the Flag, How England Saved Europe, Wellington's Men, Nelson and His Captains* and *The Commander of the Hirondelle.* These works are circulated and read throughout the English-speaking world.

Fitzpatrick, Hon. Sir Charles, was born in the city of Quebec in 1853, and educated at Laval University. For six years (1890–6) a member of the Quebec Legislature, he was elected to the House of Commons in 1896. He was solicitor-general and, afterwards, minister of justice in the Laurier administration. He became chief-justice of the supreme court in 1906.

Five Forks is a place in Dinwiddie County, Virginia, known to history as the site of a battle fought between the Union forces under Gen. Phil. Sheridan and the Confederate army under General Lee, on April 1, 1865. General Sheridan won the battle, the result of which was the evacuation of Petersburg on April 2, Richmond falling shortly afterward.

Flag, a strip of some light cloth attached at one end to a staff, used as a local or corporate emblem by a nation or city for military and naval purposes; to express rejoicing, mourning and the like; or to make known some fact to spectators. Flags are supposed to have had their origin in the fixed standard of the Romans. One of the earliest known flags was the gonfalon, borne near the person of the commander-in-chief in battle. Besides this, there were three kinds used in the middle ages: the pennon, used by a knight who had followers to defend it; the banner, borne by a king, prince, duke or other noble, with the owner's coat of arms covering its entire surface; and the standard, used among persons of distinction in the 14th, 15th and 16th centuries. In most countries, except republics, the sovereign has his own flag. The stars-and-stripes of the United States was adopted by Congress on June 14, 1777, nearly a year after the Declaration of Independence, and consisted of 13 stripes alternately red and white and a device of 13 white stars on a blue ground in the upper corner nearest the staff; the number of stripes and stars agreeing with the number of states. There are many theories of the origin of our flag, but none is satisfactory. Washington's arms contain the stars and stripes, but they are neither blue, red nor white. It will never be known who designed the union of stars. It is claimed that in 1776 Mrs. John Ross of Philadelphia, at the suggestion of Washington and George Ross, made and partially designed the first national flag combining stars and stripes. It was first displayed at Fort Stanwix, now Rome, N. Y., on Aug. 2, 1777, and Paul Jones asserted that he was the first to display it at sea, but it was slow to get into general use. In 1818 it was enacted that the stripes should continue to be 13, that the stars should be 20 in number, there being then 20 states, and that a star should be added for every new state coming into the Union. In 1907 the number of stars had increased to 46. The flag of Great Britain has the insignia of England, Scotland and Ireland on a quartered field, two quarters red, one yellow and one blue. The naval flag, called the Union Jack, has a blue ground, crossed by the crosses of Saints George, Andrew and Patrick. The French flag, called the tricolor, has three broad, perpendicular stripes of blue, white and red. The German imperial standard is yellow, divided by the iron cross into quarters, on each of which are three black eagles and the crown, with the imperial arms on a gold shield in the center. The German merchant-flag is of red, black and white in horizontal stripes. The Russian flag was yellow, with the Russian arms. The flag of Denmark probably is the oldest in existence, dating from the 13th century, and is red, with a white cross. The flag of Turkey is red, with a white crescent moon and eight-pointed star. By the consent of all nations a flag of truce is white; striking the flag denotes surrender and placing the flag of one country over that of another indicates victory; flags at half-mast mean mourning; the red flag mutiny; the black flag a pirate; and the yellow flag quarantine.

Flag-of-Truce. A white flag raised by one party in time of war to indicate to the opposing party their desire to communicate with them, as, for example, concerning terms of settlement or capitulation. There are certain rules in connection with the use of the flag-of-truce, the observance of which has come to be considered by nations as morally obligatory. While it is not at all necessary that hostilities should be suspended, or firing stopped, upon the erection of a flag-of-truce, the deliberate shooting of the bearer of a flag-of-truce is considered to be a very disgraceful and unjustifiable act. On the other hand, to use a flag-of-truce as a means for spying upon the resources of the enemy or other such illegitimate purpose, is considered especially dishonorable. The bearer of a flag of truce may be held by the enemy, if deemed advisable. Flag-of-truce proceedings, to be regular, must be conducted by the senior officers of the respective forces. In naval engagements the vessel bearing the flag-of-truce is usually kept off by the recipients at a safe distance, unless her harmless character is clearly apparent, in order to avoid the possibility of treacherous use of torpedo-boats, etc.

Flamin'go, a bird with very long legs, a long neck and very singular bill. Formerly the flamingo was classed as a wading bird, but now it is frequently united with the ducks, or placed in a group by itself between ducks and geese, and herons and storks. It is the long legs and neck that made the true relationships obscure. The lower part of the bill forms a deep, broad box, into which the upper part fits like a cover, and the whole is bent abruptly downward in the middle. The margins are provided with ridges arranged crosswise as in the duck's bill. Much mud is taken with the food (small crustacea, mollusks, vegetables), and is afterward strained out between the furrows on the bill. There are about eight species living (they were more numerous in geological times) in tropical and subtropical countries. Only one species is found in the United States, in the marshes of Florida and Louisiana. It is rose-colored and deep red; the young are white. In zoological gardens flamingoes lose their bright colors. The nests are of mud, from a few inches to a foot and a half high, and the birds sit with legs folded under the body, not, as was formerly supposed, astride the nest.

FLAMINGO

Flammarion (*flȧ'mȧ'rē̆'ôn'*), **Camille,** French astronomer, was born at Montigny-le-Roi (Haute Marne), on Feb. 25, 1842 and educated at Langres and under Leverrier in Paris. In 1862 he founded a monthly review dealing with astronomical matters, and has written extensively on the heavenly bodies, founded astronomical societies and observatories, etc. Among his more notable works, many of which are to be found in English translations, are *The Plurality of Inhabited Worlds, God in Nature, The Atmosphere, The Stars and the Curiosities of the Heavens, Urania,* etc. M. Flammarion takes a lively interest in the planet Mars, and has made many balloon-ascents to study the condition of the atmosphere at great altitudes.

CAMILLE FLAMMARION

Flan'ders, the country of the Flemings, lying on the North Sea, embraced the present Belgian provinces of East and West Flanders, the southern portion of Zealand in Holland and the greater part of ancient Artois in France. It was originally inhabited by Belgic tribes, on whose subjection by one of Cæsar's lieutenants it was added to Roman Gaul. It was afterwards overrun by Franks, and, by the treaty of Verdun, Flanders was added to Neustria. The first government of the country was presided over by a count, Baldwin I, appointed by the king of France in 837. The town of Valenciennes was added in 1006, as were also Ghent and the Zealand Islands. Under Baldwin V the counties of Alost, Tournai and Hainault were added. On his death the Netherlands portion was set aside for Baldwin's younger son, who, on the death of his elder brother, wrested Flanders from the widow, leaving to her and her son Hainault only. From this time to the end of the 12th century the Flemish territories remained thus divided. In the 10th and 11th centuries Flanders rose to be the chief center of wool-weaving in Europe. In 1256 the Zealand Islands were given to the count of Holland, and they still remain in Holland's possession. From 1302 to 1320 the Flemings struggled successfully with France. In 1529 France resigned her claims to Flanders, and with the accession of Philip II to the throne of Spain the history of Flanders becomes identical with that of the Spanish Netherlands. The treaty of Westphalia transferred Dutch Flanders to the United Netherlands, whilst by the treaties of the Pyrenees in 1659, Nimeguen in 1678 and Utrecht in 1713 Louis XIV succeeded in adding to France Artois and a large part of French Flanders. By this last treaty and that of Rastadt, in 1714, the remainder of Flanders was assigned to Austria, and is known as the Austrian Netherlands. On the formation of the new kingdom of Belgium, in 1831, the provinces of East and West Flanders were united with it. The area of these provinces is 2,408 square miles, with a population of 2,004,784. West Flanders abuts on the North Sea, and has a fertile soil, good for growing flax and cotton, and is also noted for its cattle and leather-trade. The people of both provinces are chiefly Roman Catholics and of Flemish stock. Ghent (pop. 164,659) is the capital of East Flanders; while Bruges (pop. 53,995) is the chief town of West Flanders, with its seaport of Ostend (pop. 41,698). The active industries of West Flanders include fishing, lace-making and spinning and weaving linen, together with the growing of flax, hops and tobacco. In East Flanders the industries are much the same, in addition to cattleraising and the manufacture of cloth and paper. The two principal rivers are the Scheldt and the Lys.

Flandrin (*flän'drăn'*), **Jean Hippolyte,** an historical and portrait painter, was born at Lyons, France, May 23, 1809. Between 1842 and 1845 he decorated many churches in France, and was ranked as the greatest religious painter of the century. His great frescoes, *Christ Entering Jerusalem* and *Christ Going up to Calvary*, in the church of St. Germain, at Paris, and his picture of *St. Clair Healing the Blind*, in the cathedral of Nantes, are among his best-known works. He died at Rome, March 21, 1864.

Flat'fish, the name given to a number of salt-water fishes, flattened from side to side like the flounder, halibut, plaice, sole and turbot. Some fishes are flattened from above, like skates, torpedoes, etc., but these are not called flatfishes. The true flatfishes have lost their symmetry, both eyes come to occupy one side, and the mouth is twisted. They lie on the bottom with the blind side downward, and, in swimming, progress through the water with this side underneath. The upper side is colored, but the under side is whitish. When these fish are first hatched, both sides are alike and the eyes are symmetrically placed right and left. Soon they begin to become flattened, and the eye of one side travels gradually over the crown of the head and becomes placed close to the other eye. The mouth also becomes twisted. In the meantime the fish turns on one side, and, in swimming or resting, keeps the blind side downward. The colors also disappear from this side. Recent experiments tend to show that if the blind side is kept illuminated by light reflected from a mirror, the white side will remain colored or develop its color again.

Flat'heads, a term applied to the Selish Indians, a small tribe dwelling on Clark's

Fork, in Idaho. The men are industrious and have become good farmers, and, although brave and good warriors, have never fought against the whites. Their name refers to the ancient practice of flattening the skulls of young infants in various ways, as was done in Peru before and after the arrival of the Incas, among the Caribs in Central America, Mexico and Florida and among the mound-builders of the Ohio and Mississippi valleys. Among modern Indians the practice is mostly confined to the Chinooks and other tribes of the northwestern coast of North America.

Flax. Species of the genus *Linum*, and especially the cultivated flax, *L. usitatissimum*. The genus contains about 80 species, belonging to the temperate regions both of the northern and southern hemispheres. The flowers are bright and showy and remarkably regular. The common flax has been cultivated from ancient times, and is unknown in its original wild state. It is cultivated not merely for its valuable fiber but for linseed or flaxseed oil. The fibre is used for the coarsest as well as the finest fabrics, and is not only valued for finest linen cloth and filmy lace but is employed in the body of cordage and rope. It was raised in Egypt in the days of the Pharaohs; has been famous for ages; and is still grown there in large quantities. Of the European countries where it is extensively cultivated Russia, Belgium and Ireland stand to the fore. Cultivation of it was begun in America by the early settlers, and some impetus given when the supply of cotton was cut off by the Civil War. Of late flax-culture for fibre has been receiving increasing attention. It will grow in almost all parts of the United States, but requires a great deal of care and labor. The flaxseed production of the United States in 1906 was 25,576,146, bushels.

FLAX

Flea, a small, wingless insect with a sharp pointed beak, by means of which it punctures the skin of animals upon which it lives, leaving a red, itching blotch. These insects have powerful legs, and are remarkable jumpers. Fleas live on the dog, cat, rabbit, pigeon and poultry. The fleas of the dog and the cat will also attack man, but there is another species of fleas known as the human flea. To rid a dog or cat of fleas, the animal should be dusted with Persian insect powder, and the sleeping-places thoroughly cleaned. The human flea is not very abundant in the United States, except in warm, sandy districts, but they are common in Europe. In northern Africa and in some eastern countries they are a terrible torment. A single flea will inflict many bites. As a protection, the tops of the stockings should be dusted with insect-powder, and it may also be sprinkled between the sheets at night.

Fleur-de-Lis, a symbol in heraldry, meaning literally flower of the lily, is famous as the emblem of the kings of France in the middle ages. The full device was three lilies on a blue field or ground. The origin of the fleur-de-lis in nature appears to have been, not the lily proper, but the iris-plant. Its conventional form has been traced back to the ancient Etruscans.

Flicker, a bird with many names, a member of the woodpecker family. It is known as Yellow-Hammer, High-Hole, Golden-Winged Woodpecker, etc. It is a large bird, considerably larger than the robin. When flying, it displays a shimmer of yellow and a flash of white; the wing-shafts and lining and tail-quills are a rich yellow, the tail white on the upper side. Above, it is a grayish brown barred with black, wings black and yellow, a noticeable patch of white low on the back, the head gray. It wears a noticeable top-collar of a beautiful shade of red; the light color underneath is thickly dotted with black, with a black crescent on the upper part of the breast. He is a handsome fellow and yet, on the ground, not conspicuous, his protective coloring being that of the ground, where he frequently feeds. Ants are his chief food. Though a woodpecker, he leaves most of the boring to other members of the family, and gets his ants from the ground or from decayed wood. He is not above using another woodpecker's deserted nest, but often bores nests in apple trees and decayed stumps; sometimes the nest is found 60 feet up from the ground. Six white eggs are the rule. The breeding-range is throughout the eastern states.

Flint, a mineral, a variety of quartz, consisting almost entirely of silica, with a little lime, oxide of iron, water and, sometimes, carbon. It varies in color from almost black to light brown, red, yellow and grayish white, and is sometimes mottled or spotted. Flint is often found imbedded in chalk, and is also found in beds or veins. It was used to strike fire with steel and in firearms. The most ancient use of it was for sharp weapons and cutting instruments. It was also used by American Indians for arrowheads.

Flint, Austin, American physiologist and writer, was born at Northampton, Mass.. on March 28, 1836, and graduated in 1857 from Jefferson Medical College, Philadelphia. In 1859 he removed to New York, and, after filling the chair of physiology in a school of medicine in New Orleans, became professor of physiology and microscopic anatomy in the Bellevue Hospital medical college and lecturer in the Long Island college-hospital. In 1874 he was appointed surgeon-general of New York state. He carried out many experiments in human physiology leading to important discoveries, especially in regard to the liver. He died in 1915. Among his works are: *The Physiology of Man* (1888); *Chemical Examinations of Urine in Diseases* (1870-84); *Effects of Severe and Protracted Muscular Exercises* (1871); *Source of Muscular Power* (1878); *Text-Book of Human Physiology* (1875); *Experiments Regarding a New Function of the Liver* (1862); *The Physiology of the Nervous System* (1872); *Mechanism of Reflex Nervous Action in Normal Respiration* (1874); *The Treatment of Diabetes Mellitus* (1884); *Chemical Examination of the Urine in Disease* (1893); *Stercorin and Cholesterœmia* (1897), and *Handbook of Physiology* (1905).

Flint, a city and the seat of Genesee County, Michigan, is situated on the Flint River, sixty one miles northwest of Detroit. It is strategically situated in the very center of southwest Michigan. It is served by the Pére Marquette, Grand Trunk, and Eastern Michigan railroads. Two municipal and one private airport connect it with the larger cities. The city and suburban area includes 276,658 acres.

Flint is a beautiful city, with a fine residential atmosphere. There are no tenements, and few apartment houses, the residences being chiefly one and two-family houses. There are ninety-four churches within the city. There is an excellent school system, including elementary schools, both public and parochial; Junior and Senior High Schools and Junior College; and private schools. There is also the county Normal school, a business University and State School for the Deaf. The Deaf and Dumb Hospital is located in Flint, and the Oak Grove sanitarium for mental diseases.

There are many manufacturing establishments in Flint. The automobile industry is chief in importance. Several nationally known automobiles are manufactured here, and the city is also noted for the manufacture of automobile supplies. There are extensive machine shops, grey iron foundries and a brass foundry. Paint and varnish are manufactured; a welding plant is situated in the city, as are also woolen, lumber, and flour mills. Brick yards employ many of the city's inhabitants.

Flint is renowned for its rapid growth. This city had the largest percentage of growth between 1900 and 1910 of any city of over 25,000 in the United States. From 1910 to 1930 the population increased more than 400 per cent. Of the total population, 82.9 per cent are native whites, 3.7 per cent are Negroes, and 13.4 per cent are foreign born. The population in 1930 numbered 156,492.

Flint Implements of the primitive people of prehistoric times are commonly found on the graves or on the sites of settlements of the earlier inhabitants of almost every country in Europe. They consist of spearheads, arrowheads, daggers, knives, saws, borers, scrapers, chisels and axes. No modern savages or barbarous tribes have produced anything so finely finished as the weapons and implements of the prehistoric peoples. Some of them, as the knife-blades and dagger-blades of Denmark and Sweden, are marvels of workmanship. Flint is the only kind of stone capable of being worked into a variety of shapes by flaking and chipping.

Flodden, Battle of, fought on Flodden Field on the Scottish borders at the base of Flodden Hill, between James IV of Scotland and an English army under the Earl of Surrey, on September 9, 1513. It was the most grievous defeat that Scotland ever suffered. King James had 30,000 men, and the Earl of Surrey 32,000; the former lost from 5,000 to 12,000 men, including the archbishop of St. Andrews and twelve earls, and the latter 4,000 men. The sixth canto of Sir Walter Scott's *Marmion* contains a splendid and fairly accurate description of the battle.

Flood Plains are level tracts of land which have been formed by the sediment deposited by a river when in flood. The flood-plains of the Nile, the Mississippi, the Po and other rivers are of great extent and very fertile. Frequently the course of a river changes by a gradual swing to one side, owing to the settling of sediment in its own channel, and in this way a *delta* of flood-plains is apt to be formed, as in the case of the Nile and the Mississippi, at its mouth.

Floods, bodies of water rising and overflowing land not usually thus covered; inudations. Areas of low ground near rivers or oceans are in danger from floods, the most destructive of which, as well as the most common, are the river floods from melting snows in springtime or sudden heavy downpours of rain. The most famed instance of river flooding is the annual occurrence in the Nile. In June of each year the waters of the lower Nile begin to rise from the weeks of flowing from the upper waters. This continues until September inundating a vast tract of flood plain and delta, raising the water level at Cairo to a height of twenty-five feet above normal. This flooding deposits sediment which makes the land fertile, and Egyptian agriculture possible.

In the United States, the greatest floods are caused by the Mississippi. Land covering an area of 30,000 square miles and supporting a population of over 1,000,000 people is liable to flood from this source. Heavy rains and melting snows in the Missouri, Ohio and Mississippi river valleys cause these inundations. In the greatest floods the Mississippi discharge reaches 2,000,000 cubic feet per second, the water level rising forty or fifty feet. In the present century, there were great floods in 1903, 1912, 1922 and 1927. That of 1927 was the most disastrous known, amounting to a national calamity. The area of inundated land was estimated at 28,573 square miles, and the monetary loss at $284,117,631, exclusive of railroad losses. The same year saw a loss of $32,600,000 of property and eighty-eight lives in a flood of the Winooski and Connecticut rivers, including most of New England and eastern New York. There annual flood losses in the United States, making an annual average loss of $50,000,000, exclusive of the great permanent loss by soil erosion.

In China, many of the river basins are liable to extremely severe floods. The Hoang-ho from the mountains flows over a low fan delta, rapidly growing out into the sea, so that Putai, a seacoast town 2,000 years ago, is now forty miles inland. The Hoang-ho has changed its course nine times in 2,500 years, and laid waste a region the size of Great Britain, changing its mouth fully 200 miles. In the flood of 1887, 1,000,000 people were drowned, and more died of the famine and disease which followed. There were disastrous floods in southern France after heavy constant rains late in February, 1930.

Sea floods are much less common than river floods. Coasts are often high, and others are rarely visited by high seas or tidal waves. A classic illustration of low coast and flood liability is given by the Netherlands, on the great plain which is the delta of the Rhine and the Meuse. Much of it is well below sea level, and subject to inundation from both river and sea. Great dikes now hold back the floods. In 1421, when dikes were less well constructed, a flood destroyed seventy-two villages and 100,000 people. During the Spanish War the people opened the dikes and flooded their country to protect it from invasion. Tidal waves also cause floods, particularly in the lowlands of the Netherlands, Denmark and England.

In June, 1932, severe floods occurred in the Moldavia section in Rumania resulting in a death toll of 400, and making 2,000 homeless.

Flora, an ancient Italian deity, the Roman goddess of flowers. At Rome two temples were erected to her. She was represented as a flower-crowned maiden, in the full bloom of maidenly beauty. On the occasion of her festival, held at the end of April, the dwellings were decked with flowers, and feasting, dancing and singing prevailed everywhere.

Florence, a city of Italy and capital of the province of Florence (Firenze), is situated in the valley of the Arno. The establishment here in 1864 and 1865 of the seat of the Italian government was the means of increasing the city to nearly double its former extent. The chief building in the city is the cathedral, the foundations of which were laid in 1298. In 1887 the finished building was uncovered with great pomp in the presence of the Italian sovereigns. The dome served Michael Angelo as a model for St. Peter's. The church contains sculptures by Michael Angelo and other famous artists. There are many other handsome churches in Florence, containing a wealth of paintings and sculpture. Among the famous palaces are Il Bargello, Vecchio, Signoria, Uffizi, Pitti, Riccardi and Strozzi. The Pitti palace contains the national library, with 200,000 volumes and 10,000 manuscripts, and the famous Florentine gallery of art, filling twenty-three rooms. The city of Florence sprang originally from Fiesole, at the foot of which it lies extended. In the eleventh century it was bequeathed to Pope Gregory VII, and, under the protection of Rome, became a city of importance. By 1250 it had become one of the first cities of Italy and held its place for many years. In 1348 the black death carried off 100,000 of the city's inhabitants. In 1529 the city was besieged by an army under the duke of Orange and fell on August 8, 1530. After the constitution of the united kingdom of Italy, Florence held the position of provisional capital from 1864 to 1871. In art Florence holds a unique place, the Florentine school being the most important in Italy. In literature its position is hardly less important, as is attested by the names of Dante and Boccaccio. The population, according to the census of 1931, is 316,286.

Florida (*flŏr'ĭ-dȧ*), the most southern state of the United States, and a popular winter resort, is a peninsula forming the southeastern tip of the United States. It is bounded on the east by the Atlantic Ocean, on the west by the Gulf of Mexico, and on the north by Georgia and Alabama. From its shape and position it has been given the name of "the Peninsula State." It is also known as the "Everglade State" from the famed great marshes of the Everglades. The name Florida is taken from *Pascua Florida,* the Spanish name for Easter Sunday or Feast of Flowers, on which day Ponce de Leon first saw the low white sand dunes and the surf rolling in to the shore of this beautiful state. It was a land of sunshine, beautiful as the tropics, with winds sweeping the shores and inland forests hung with moss and alive with exquisite flowers. It seemed to him a land of flowers, and the name Florida therefore wholly fitting. Florida extends over an area of 58,666 square miles, including 3,805 miles of water.

Surface. Florida is of coral formation, slenderly shaped, being nearly 450 miles long and about eighty-four miles in average depth, with a coast line of about 1,150 miles. The surface is for the most part low and flat, rising on either side from the coast, a few feet above sea level, to a central ridge which extends north and south, forming a divide and separating the streams of the east coast from those of the west. The highest elevation above sea level is only 325 feet, which is reached at Iron Mountain in Polk County. No other state, except Louisiana, has such a low average elevation. Almost the entire eastern coast, and much of the western coast, is dotted with sand reefs and narrow islands, which embrace shallow bodies of water, called bays, harbors, lagoons, and lakes. Within the central region alone there are approximately 30,000 lakes, formed largely as a result of sinkholes or depressions from the solution of the limestone which is a feature of the country. Many of these lakes are connected by subterranean channels, and when one changes in surface, another often changes also, because of this intimate underground connection. There are many springs. The southern part of the peninsula is formed of a succession of coral dikes, in the upper part of which is the famed Lake Okeechobee, whose waters form the Everglades, with its extensive swamps.

Lake Okeechobee is a shallow, fresh-water lake, and the largest in the state. It covers an area of 1,000 square miles. Its expansion forms the delta-like Everglades, swamplands of forest, with moss and tropical growths. The swamps, which cover about one-fifteenth of the total area of the state, are being drained and provided with good roads as an aid to agriculture. Most of the lakes are small and of slight importance. Lake Wales, however, is internationally known. This is a town amid high hills, which are covered with orange groves down to a myriad of clear and beautiful lakes, closely connected. At Mountain Lake is the beautiful column of the Bok Singing Tower. This was erected as a sign and symbol of the protection of wild life, the surrounding country being a famed bird sanctuary. Thousands of birds rest on the waters and shores of these lakes and find shelter in the trees. The Tower houses the largest and finest carillon in the world, which is played daily every evening at sunset from December until May, its clear notes ringing out across the waters.

There are in the land some 25,000,000 acres of inland forest land. This is approached from the swamp and marsh areas through the low bottom-lands which are excellent for the production of cotton, sugar-grain, fruits and vegetables. Higher hummocks have a productive, dark, grayish soil. Part of the forest lands are sandy, but also well limed, in which soil citrus fruits grow well, with the pine, oak and hickory that flourishes there. Good pasture is found in the barren land where inferior pine trees grow. The forests proper are filled with live-oaks, cypress, hickory, holly, magnolia, dogwood, mangrove, torchwood, mahogany, lignumvitæ, and palmettos.

The islands are for the most part of the same sandy low formation as the coast lands. They are innumerable, ranging in extent from the small sandy keys to islands such as Santa Rosa and Key Largo, which are thirty to fifty miles long. Islands protect the many harbors, with which Florida is well provided, especially at Fernandina, St. Augustine, Key West, Cedar Keys, Tampa and Pensacola Bay.

Rivers. Florida has nineteen navigable rivers. These are found chiefly in the northern part of the state, where the surface is an extension of the Alabama uplands, and drainage is necessary. The southern part of Florida, including the Everglades, is wholly swampy and marshy. One of the most important rivers is the Suwanee, with its branches, which flows from north to south across the northern section of the state, and has been the subject of poetry and song for generations. The St. Mary's river forms part of the boundary between Florida and Georgia. The St. Johns, a wide river flowing south in the northeastern part of the state, is nearly four hundred miles long. The Apalachicola flows from the north in the narrow western portion of the state, to empty into Apalachicola Bay and thus into the Gulf of Mexico. Among the shorter rivers are many of great beauty, such as the Halifax River, which bisects the city of Daytona Beach, a veritable paradise for tourists. The Ocklawaha River is not only lovely, but also famed as the crookedest river in America. This river is formed largely by Silver Spring, the largest spring in the world, which is situated six miles east of Ocala. The clear water reveals from glass-bottomed boats every portion of the great basin of the Spring, which is eighty feet deep and three hundred feet in diameter. This marvelous spring flows into the Ocklawaha River. These rivers, as well as the lakes and swamps, are the homes of alligators. Turtles are taken among the keys, and manatees along the Atlantic coast.

Climate. The climate of Florida varies from temperate to semi-tropical. Summer heat is not extreme, however, even in the southern part. Florida has the longest sea coast of any state in the Union, which, with its narrow width in many parts, keeps the temperature more equable, as it is moderated by the sea breezes. In the autumn season, hurricanes from the West Indies frequently cause much damage. There is about fifty-four inches of rainfall annually, falling chiefly in the summer months. The continual winds, the warm climate, and the winter sunshine, make this state a healthful and popular resort for tourists.

North and west of a line drawn through Cedar Keys and Fernandina there is decidedly southern climate, similar to that of the Gulf States. From this division to another reaching from the mouth of the Caloosahatchee to the Indian River outlet, is a semi-tropical climate, with a sub-tropical climate farther south. Although all of Florida is delightfully situated from a climatic standpoint, there are some sections more famed than others. Daytona Beach, midway between northern and southern Florida, is situated in the most temperate and ideal climate of the entire state, with warm sunshine in winter and cool ocean breezes in summer, making it a favorite resort of tourists. Fort Myers, the "city of palms" on the lower gulf coast, is an example of the subtropical resorts. Eighty varieties of rare palm trees, beautiful orchids and tropical foliage add to the attraction of this city and surrounding country, where Henry Ford and Thomas A. Edison have winter homes. Pensacola has excellent beaches and a delightful climate. St. Petersburg is called the "Sunshine City." So famed is this condition that the largest newspaper in the city gives away its circulation on any day in which the sun fails to shine. In nineteen years, the paper was given away but ninety-seven times, which is sufficient proof of the weather, making this one of the most popular of all Florida's many popular resorts.

Minerals. The chief mineral of Florida is phosphatic rock, of which there are extensive natural deposits. This rock constitutes half of Florida's mineral output, and is a source of the greater part of the phosphate produced in the United States. Before the World War, more than 1,000,000 tons were exported annually for use as land fertilizer, and much was consumed domestically. In 1930, there were produced 3,248,071 long tons; in 1932, 1,483,000 long tons valued at $4,652,000. Stone is second in importance among the minerals of Florida, and 1,796,670 long tons were produced in 1930. A sixty-acre deposit of travertine was discovered in 1929. Other minerals include fuller's earth, lime, kaolin, clay, a little coal and a few semi-precious stones. Mineral waters are of importance in the industry of the state. In 1930, the total mineral output was valued at $15,484,206.

The deposits of phosphate were first located in 1888, land and river pebble phosphate being found in scattered formation about thirty miles wide on the west coast, extending from Lake Okeechobee to Tallahassee. Since the date of their location, Florida has been the chief source of the world's supply of phosphate. The fuller's earth was discovered in 1893. Florida is now the principal source of fuller's earth in the United States. Gypsum, lignite and cement rock have been discovered but not developed commercially. No metals have ever been found in Florida.

Production and Industry. Agriculture is the chief occupation of the state, although only about twelve per cent of the land area is in farms. Fruits are an important product. Florida produces more grapefruit than any other state in the Union. In 1932, there were produced 9,200,000 boxes of grapefruit. Other fruits, with their production in 1932, include oranges, 14,300,000 boxes; limes, 10,000 boxes; and pineapples, 6,000 boxes. Large areas are devoted to the raising of these fruits and also grapes, bananas, pears, and guavas. The fertile soil and abundant moisture is favorable for other crops, also. Vegetables valued at $30,000,000 were produced in 1932. Rice, maize, oats and peas are raised extensively, and the sweet potato and peanut crops have become very valuable. From 96,000 acres, in this same year, was produced 15,000 bales of cotton. Sea island cotton of high grade is produced. There were 2,961,000 pounds of tobacco raised. These crops were raised on farm lands which, in 1930, aggregated 5,260,257 acres. An interesting development in the history of the agriculture of Florida is the attack of the citrus crop of 1929 by the Mediterranean fruit fly, which caused a loss of $10,000,000 before it was eradicated by Federal aid.

The most important industry of Florida is the production of lumber. Florida has about 5,450,000 acres of original pine forests and large forests of second growth pine, from which come one-third of the national supply of "naval stores." In 1932, from 343 establishments were produced 156,000 fifty-gallon barrels of turpentine; 527,000 five-hundred-pound barrels of resin, valued at about $6,500,000, and also tar and pitch. The forest trees include pine and live-oak, which are the chief sources of lumber, and also cypress, hickory, magnolia, holly, mahogany, palmetto, mangrove, torchwood, and lignumvitæ.

There are extensive fisheries on the long coast line, yielding $20,000,000 annually. The chief products of these fisheries are oysters, shad, red snappers, mullet, turtles, and sponges, of which latter product Florida has almost a monopoly.

The census of manufacturers in 1929 reported 2,214 establishments employing 64,936 workers who earned $54,661,968 and produced $232,912,261 worth of goods. The raw material, fuel and power used was valued at $97,102,524. Among these manufactures are cotton seed oil, meal, and fertilizer, in addition to the many lumber products, which include also wooden boxes, lead pencils and barrels.

Transportation. Florida has excellent transportation facilities, both by land and water. In 1931, there were 5,628 miles of steam and 226 miles of electric railway. The many navigable rivers afford water transportation, and the state maintains 8,338 miles of highways, of which 4,866 miles are surfaced. There are steamship connections from the important ports of Key West, Tampa, Pensacola and Jacksonville, with Cuba and the leading Atlantic ports of the United States and Europe. Miami is an important air port, served by the Pan-American Airways, which affords airplane transportation north to Canada, and south to Cuba, Central and South America.

Population. There is a large negro population in Florida, and many foreign-born whites. In 1930, the total population of the State numbered 1,468,211, an increase of 51.6 per cent over the population of 1920. Of this number, there were 59,057 foreign-born whites, of whom 6,287 were from Cuba; 2,131 from others of the West Indies; 7,084 from England; 1,843 from Ireland; 1,797 from Scotland; 5,464 from Germany; 5,262 from Italy; 8,156 from Canada, and 4,125 from Spain. Of the total population, 29.4 per cent were Negro, and 51.7 per cent urban. The Indian reservation, comprising in 1931 an area of forty-two square miles, had a population of 575. The largest cities of the State and their populations in 1930 are: Jacksonville, 129,549; Miami, 110,637; Tampa, 101,161; St. Petersburg, 40,425; Pensacola, 31,579; Orlando, 27,330; and West Palm Beach, 26,610. Tallahassee, the capital, has a population of 10,700.

Education. Public school attendance in Florida is compulsory, and all public schools are required to have readings from the Bible without sectarian comment, at least once every school day. There are separate schools for white and colored children. In 1930, there were 2,103 elementary schools, with 7,898 teachers and 275,846 pupils; and 422 public high schools with 3,062 teachers and 70,588 pupils. The total expenditure on public schools was $13,419,351. The large negro and rural population keeps the percentage of illiteracy relatively high. It was 13.8 per cent in 1910, reduced to 9.6 per cent in 1920, and to 7.1 per cent in 1930. Among the native whites illiteracy is 1.9 per cent; among the foreign-born whites, 5.4 per cent; and among the Negroes, 18.8 per cent.

The State provides higher education in the University of the State of Florida, which was founded in 1884, and is situated in Gainesville. In 1932, this institution had an enrollment of 2,556 students, with a faculty of 187. A State College for Women is also provided at Tallahassee, which was founded in 1905, and has an enrollment of 1,707 students, and 122 teachers. Other institutions of higher learning include the John B. Stetson University at DeLand, the Rollins College at Winter Park, and the Agricultural College for Negroes at Tallahassee. There are private and denominational schools, and a School for the Deaf and Blind at St. Augustine.

Government. Florida is divided into sixty-seven counties, and governed under a constitution which dates from 1885. The State Legislature comprises a Senate of thirty-eight members, elected for four years and renewed by one-half every two years; and a House of Representatives of ninety-five members, elected for two years. Two Senators and five Representatives are elected to the National Congress. Sessions of the Legislature are held biennially, and are limited to sixty days.

History. Florida was discovered on Easter Sunday, in 1512. Ponce de Leon, the famed Spanish explorer who was then hunting for the fabled fountain of youth, found the mainland on that day, the Spanish *Pascua Florida,* or Feast of the Flowers. He first landed on the coast near the present site of St. Augustine. In 1539 De Soto explored the peninsula, and in 1562 the first colony was made. This was a settlement of French Huguenots, at the mouth of the St. Johns River. In 1565 the Spaniards destroyed this colony and massacred the settlers. In that same year, the first Spanish settlement was made, the colony of St. Augustine being founded. This city is almost the oldest in the United States, and has changed ownership thirteen times. It was burned in 1586 by Sir Francis Drake, in English interests. There was much rivalry between Spain and England in the ensuing years, but the Spanish kept possession of the land until 1763, when Spain ceded Florida to Great Britain in exchange for Cuba. In 1783 Great Britain receded the territory to Spain, which country held it until 1819.

In 1819, Florida was ceded by Spain to the United States as a territory, and was at once organized under the laws of the country. In 1822 a territorial government was definitely established for east and west Florida, comprising the same area as the present state. Florida adopted a State constitution in 1833, and was admitted into the Union in 1845. Between 1835 and 1842 there were severe struggles between the Seminole Indians and the white settlers. This trouble ended only with the removal of the tribe to Indian territory.

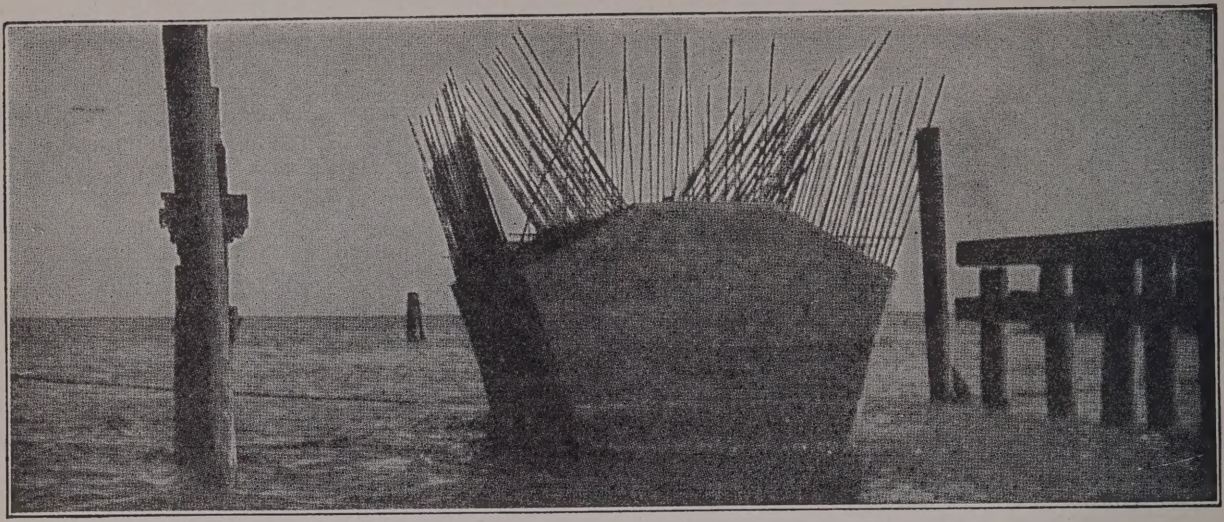
Florida seceded on January 10, 1861, joining the Confederacy. During the Civil War, however, there was but one important battle fought within its territories, which was the battle of Olustee, in February, 1864. Florida was one of the first states to return to the Union. It framed a new constitution in October, 1865, and was readmitted in June, 1868. The present constitution went into effect in 1885.

Florida's history would not be complete without notice of the immense growth of the state as a tourist resort. It has become popular especially as a winter pleasure-ground for the nation. In May, 1901, Jacksonville, one of the prominent cities and the largest in the state, was swept by a great fire which destroyed nearly $15,000,000 worth of property. Hurricanes have also done considerable damage. One of the most disastrous of these occurred in 1928, sweeping northward over the State, causing much damage and loss of life.

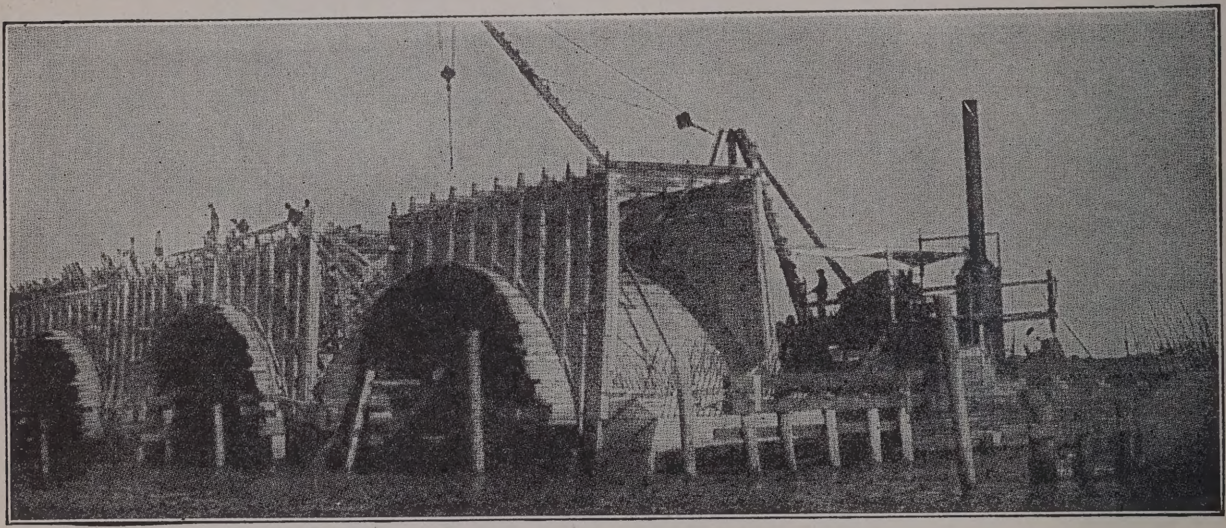
See DE SOTO, FERNANDO; EVERGLADES; FLORIDA KEYS; JACKSONVILLE; KEY WEST; MENENDEZ, DE AVILÉS, PEDRO; NARVÆZ, PÁNFILO DE; PONCE DE LEON, JUAN; RIBAULT, JEAN; ST. AUGUSTINE; SEMINOLE INDIANS; TALLAHASSEE; TARPON.

Florida Keys are a group or chain of small islands stretching south from the southern coast of the Florida peninsula. There are thousands of them, many of them of coral formation and most of them submerged by high tide. The longest of them is Key Large, and the southernmost of any importance is Key West. Here is the city of Key West, the site of a naval station, with a population of 12,831. It is a place of considerable commercial importance. It has lines of steamers connecting with the chief cities of the Atlantic coast. Its chief industry is the manufacture of cigars, and it also has a large trade in fish, fruit, tobacco, vegetables and sponges.

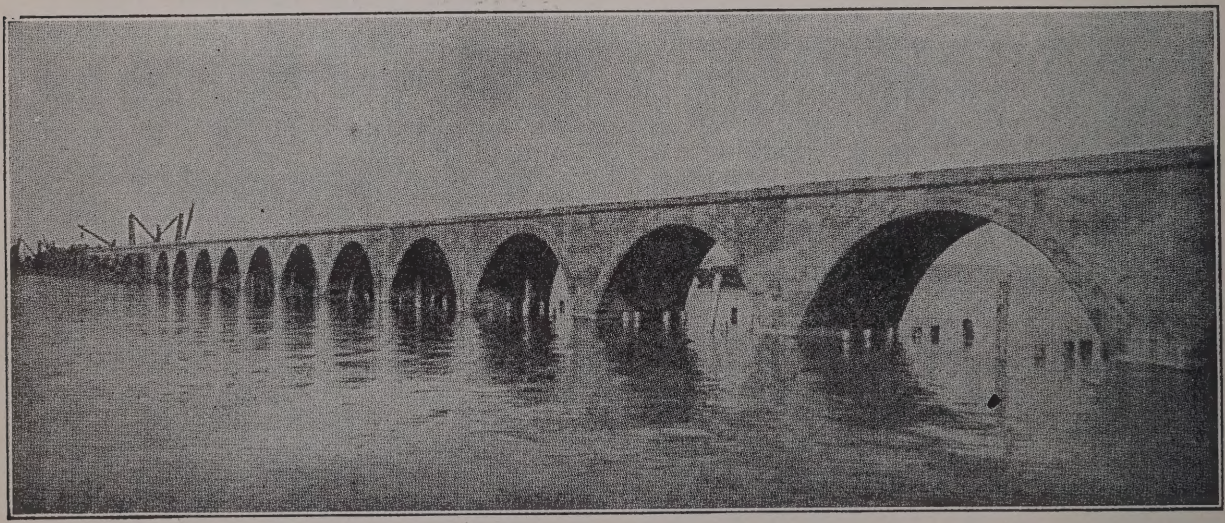
A vast and unique enterprise, the greatest engineering feat of recent years, is the railroad, which has been constructed from the mainland to Key West, a distance of 130 miles, bridging long stretches of open sea, with an equal distance built up on submerged swamps and shallows. The open water is bridged by miles of concrete viaducts, the shallows built up with solid



BUILDING PIER OF CONCRETE WITH STEEL REËNFORCEMENT

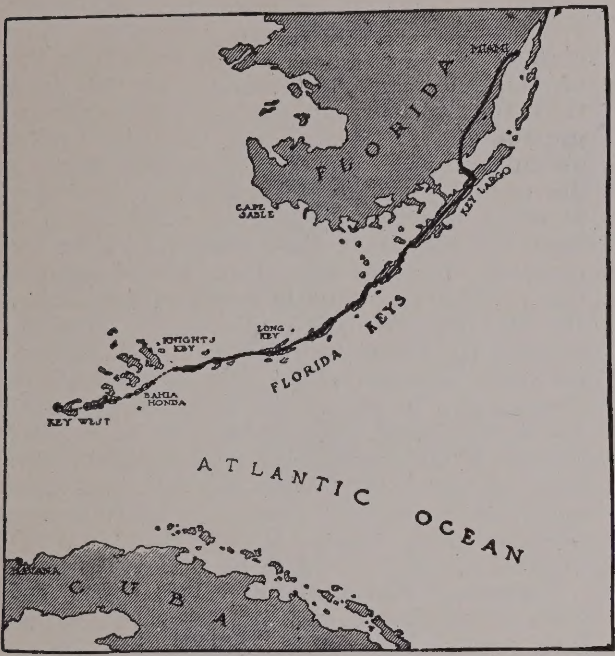


BUILDING CONCRETE ARCHES SHOWING FRAMEWORK



SECTION OF FLORIDA KEYS RAILROAD, BUILT ACROSS OPEN SEA embankments of rock, and all made to withstand the assaults of the sea, driven by tropical storms.

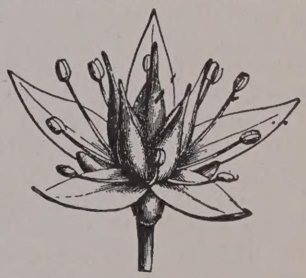
This undertaking was the work of the late Henry M. Flagler, who had previously built a road along the Atlantic seaboard from Jacksonville to Miami, with its series of magnificent hotels. His ultimate plan was to connect Key West with Havana by ferries which would carry solid trains, thus extending rail passenger and freight passage from New York into the island of Cuba.



Flotow (*flō'tō*), **Friedrich, Freiherr von,** a German composer, was born at Teutendorf in Mecklenburg, Germany, on April 26, 1812. He is chiefly celebrated for his operas *Martha* and *Stradella*, pleasing compositions of light and lively music. He died at Darmstadt on Jan. 23, 1883.

Flounder, a salt-water fish belonging to the group of flatfishes, with both eyes placed on one side of the body, which is kept uppermost in swimming or resting on the bottom. It is a good food-fish. See FLATFISH.

Flour is the powdered grain of wheat and other cereals separated from the outer husks or coverings — usually the powdered grain of wheat. Flour is far the most important part of man's food, rice being the only other cereal which rivals it in the number of human beings it feeds. Every indication points to the fact that the cultivation of wheat and other grains was one of the earliest developments of civilized man. From the remains found on the sites of ancient dwellings it looks as if grain was crushed in a hewn-out stone, and probably was no finer than the meal of the present day. A mortar and pestle were used among the ancient Romans for grinding grain, and during that period mills were introduced; a pair of millstones were found at Adel in Yorkshire, England, at the beginning of the 18th century. In England and Scotland it has not been definitely determined when water-mills were introduced, but it is known that in 560 hand-mills were in use. They were called querns, and consisted of two stones about a foot and a half in diameter, the lower one being a little convex, into which the upper one, being concave, fitted. At the present time flour-milling may be divided into four separate systems — flat milling or grinding; high milling or granulating; roller milling or crushing; and disintegrator milling or breaking. In all there are three main features — the cleaning and preparing of the wheat, the grinding and the bolting or dressing of the product. The stones used in the flat milling are usually about four feet two inches in diameter and 12 inches thick, and many grooves are cut in them. In roller-milling a pair of horizontal rollers rotate face to face, and crush the grain as it falls between them. The crushed product in all milling consists, in a general sense, of flour, bran and middlings. Flour is an important item of export to the people of the United States. Statistics regarding the flour-output of the United States vary. In 1900 the returns from 13,188 flour-mills, in 17 of the chief milling states and territories, showed that the average annual yield was 103,500,000 barrels, the value of which was $384,200,000. The export of flour in 1906-7 was 15,584,667 barrels; its value $62,175,397. The world's greatest milling center is Minneapolis. To make a barrel of flour requires from four and a half to five and a half bushels of wheat, according to the grading of the flour.


FLOWER

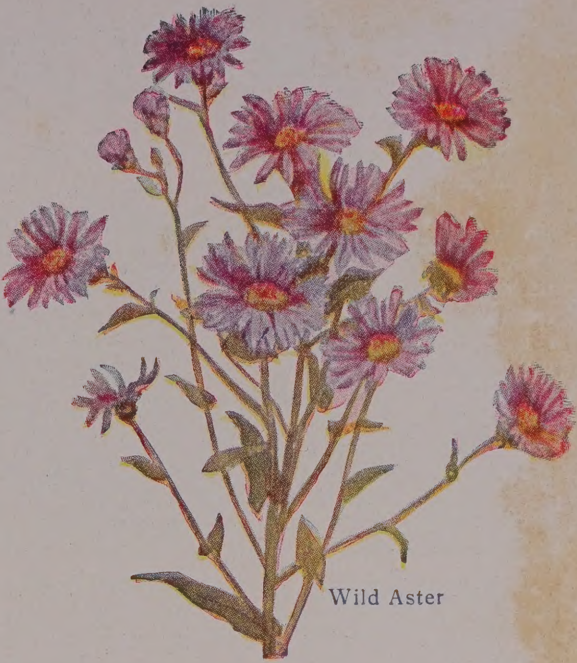
Flower. Technically a flower is a modified shoot, that is, it consists of a stem-axis bearing leaf-bodies. Both axis and leaves are variously modified. The modifications of flowers are endless, as every group of seed-plants has its own kind of flower. Taking the average flower by way of illustration, it is found to be composed of four distinct sets of organs, all of which are leaf-bodies which stand upon a very short or even flattened axis, technically known as the torus or receptacle. The two outer sets are the floral leaves, the two inner the sporangial leaves. The outer set of floral leaves is called the calyx, the individual parts being sepals. The ordinary sepals are green and leaf-like, but usually small as compared with the next set. The inner set of floral leaves is the corolla, the individual parts being called petals. It is the corolla which usually gives the display of the flower, the petals becoming delicate in texture, comparatively large in size and variously colored. The outermost set of sporangial leaves is composed of the stamens. Each stamen usually consists of a stalk-like portion, called the filament, and a pollen-bearing portion, called the anther. The anther contains usually two pollen-sacs, and the sterile tissue between them is often called the connective. The pollen-sacs are sporangia, and the pollen-grains are asexual spores. It was once thought that the stamen is a male organ, but it is merely a leaf modified to produce spores; in other words, it is a sporophyll (which see). The inner set of sporangial leaves is composed of the carpels, one or more of which may occur in the flower. Several carpels may unite to form one structure, or each carpel may remain distinct from the others, or there may be but one carpel. In any event the individual structure, whether made up of several carpels united together, or of separate individual carpels, is known as the pistil. This pistil usually develops in three regions: a bulbous base known as the ovary, which contains the ovules, which after fertilization become seeds; above the ovary there usually is a slender, beak-like prolongation, known as the style; and on the style there is developed the receptive structure known as the stigma, which receives the pollen. It was once supposed that the pistil is the female organ of the plant and that it contrasts with the stamen or male organ. It is now known that the carpels are sporophylls, that is, leaves set apart to produce sporangia, in this case the sporangia being the ovules.

Not all flowers possess all of these parts. For example, one of the sets of floral leaves may be absent, when the flower is said to be apetalous; both sets of floral leaves may be absent, when the flower is called naked; the stamen-set may be lacking, when the flower is said to be pistillate; the carpels may be lacking, when the flower is said to be staminate. In case the floral leaves are present, but cannot be distinguished from one another as calyx and corolla, it is common to speak of them all together as the perianth, as in the lilies. Very frequently the members of the same set may coalesce with one another; for example, the sepals may organize together to form a cup-like or tubular calyx. The petals may organize in a similar way, the corolla appearing like a bell, a trumpet, a tube etc. When sepals are thus united, the flowers are said to be gamosepalous; when the petals are united, the flowers are said to be monopetalous or gamopetalous or, best of all, sympetalous. When the filaments of the whole set of stamens are united, the stamens are said to be monadelphous. When the carpels are united, the pistil is said to be syncarpous. The word which contrasts with sympetalous, as indicating the opposite condition, is polypetalous; and the contrasting word for syncarpous is apocarpous. Another very common modification is that in which the sepals, petals and stamens seem to arise from the top of the ovary, the latter appearing outside the flower below the other parts, as in the common honeysuckle. Such a flower is said to be epigynous, and the ovary is often described as being inferior. The term for the contrasting condition is hypogynous. Flowers are often also irregular, the members of the different sets, notably the petals, not being all alike. This results in the formation of two-lipped flowers, spurred flowers etc. This condition of irregularity is known as zygomorphy, and the contrasting term applied to a regular flower is actinomorphy. The great purpose of the flower, with more or less conspicuous floral leaves, seems to be to secure pollination by means of insects. See POLLINATION. JOHN M. COULTER.

Flowers, National and State, Long years of association, give the flowers of a nation their peculiar significance. It is said the shamrock holds its place in the hearts of the Irish because good St. Patrick one day, whilst preaching, used as illustration the three little leaves in cluster. Mention of England's national emblem at once brings up the Wars of the Roses at the ending of which the Tudor rose was agreed upon as the emblem of the country. Mention France's emblem, and the lily comes to mind, the *fleur-de-lis*, which not even Napoleon could make lose its hold on the people. Scotland and the thistle have long-time association; and as loyal as the Scotchman to the thistle is the Welshman to the leek.

The national flower of the United States has not yet been agreed upon; but various states have adopted floral or plant emblems: Kansas the sunflower; California the California poppy; Georgia the Cherokee rose; Minnesota the moccasin-flower; Alabama, goldenrod; Arizona, sequoia cactus; Arkansas, apple blossom. Colorado, columbine; Connecticut, mountain laurel; Delaware, peach blossom; Idaho, syringa; Illinois, violet; Indiana, carnation; Iowa, wild rose; Kentucky, blue grass; Louisiana, magnolia; Maine, pine cone; Michigan, apple blossom; Mississippi, magnolia; Montana, bitter root; Missouri, goldenrod; Nebraska, goldenrod; New Jersey, sugar maple tree; New York, rose; North Dakota, goldenrod; Oklahoma, mistletoe; Oregon, Oregon grape; Rhode Island, violet; South Dakota, pasqueflower; Texas, bluebonnet; Utah, sago lily; Vermont, red clover; Washington, rhododendron; West Virginia, rhododendron; Wisconsin, violet.

Meadow Lily


Wild Aster

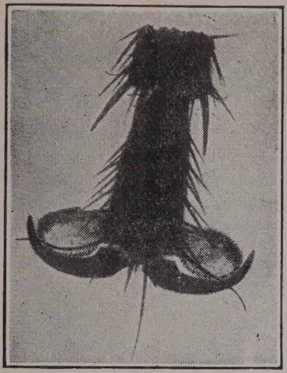
Golden Rod

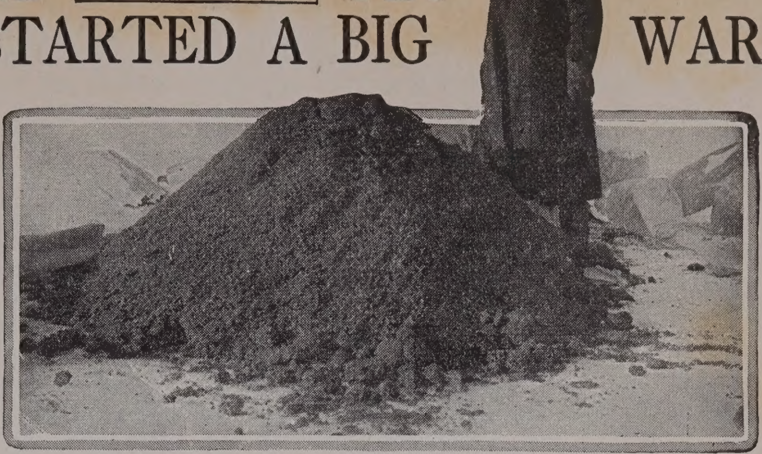
Wild Rose

Violet

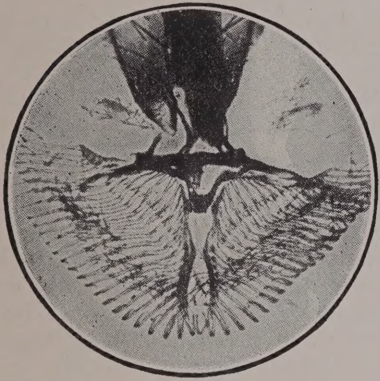
Orchid

HOW A LITTLE FLY STARTED A BIG WAR

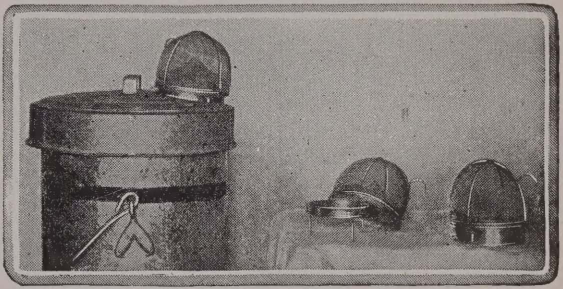




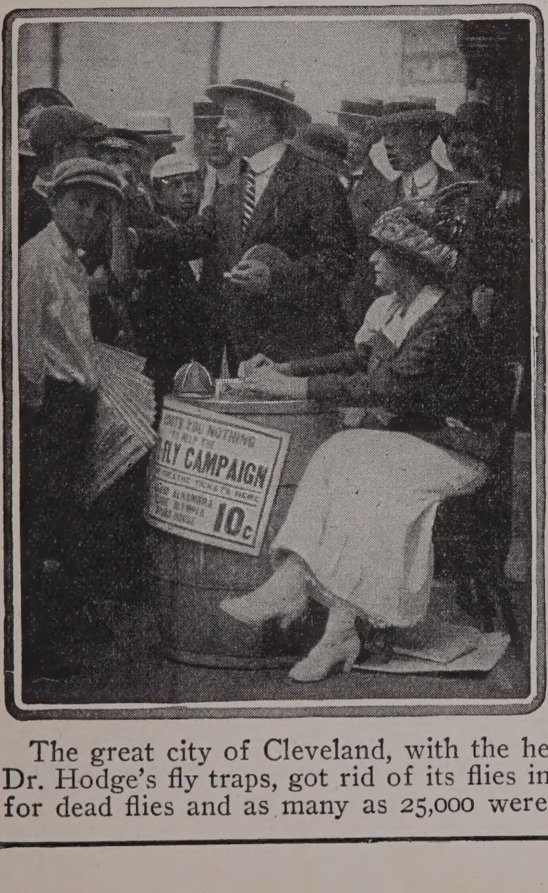
This picture shows Professor C. F. Hodge, inventor of the fly trap, and a heap of dead flies, of which sixteen million were caught in the campaign he conducted in Worcester, Massachusetts.



These fly traps were used on garbage cans and kitchen tables.



Next to the "heap of the slain" before which Dr. Hodge is standing is a picture of a fly's foot and below it, in the circle, a fly's tongue as they look under the microscope. It is with his unclean tongue and feet that the fly spreads disease.



The great city of Cleveland, with the help of the newsboys and the school children and Dr. Hodge's fly traps, got rid of its flies in one season. The city paid ten cents a hundred for dead flies and as many as 25,000 were bought in an hour.

Flowering Plants. A common name applied to the highest group of plants, now more commonly called seed-plants or spermatophytes, which see.

Flu′orspar′. A transparent or sub-translucent brittle mineral found either in crystalline or in massive form. Its chemical name is calcium fluoride CaF_2. Its color may be blue, brown, greenish, yellow, white and rarely red, but it commonly is yellowish or blue. It is found in England, Norway, Kentucky, Arizona, Illinois and Colorado. It is the chief source of fluorine and of hydrofluoric acid which is used for etching glass. Fluorspar is used in fusing certain minerals, in iron-smelting and also, when colorless, for the manufacture of lenses.

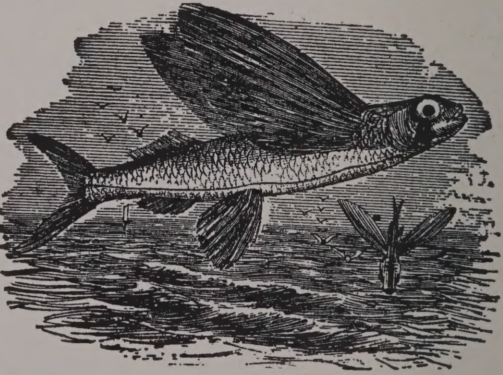
Flute, a musical wind-instrument, consisting of a tapered tube, in which the sound is produced by blowing with compressed lips into a hole near the top or wider end, which is stopped with a cork. Six holes in the lower end, closed and opened by the fingers, serve to make the musical scale. Flutes are usually made in cocoa-wood, ebonite, silver and gold. The flute is greatly used in classical music; Bach, Haydn, Handel, Mozart, Beethoven and Mendelssohn all giving it a leading part in their works. It is one of the oldest wind-instruments, having been used by the ancient Egyptians.

Flux. A flux is a substance used to make the process of melting minerals more easy. The commonest fluxes are limestone and fluorspar. A white flux is a mixture of the nitrate and carbonate of sodium or sometimes of potassium. A black flux includes carbonate of potash to remove silica and charcoal to combine with the oxygen in a metallic ore. In pottery, boracic acid, red lead and sand generally are the chief ingredients in the fluxes. A flux acts by combining with the useless matter in the ore, forming a slag in which the metal is left as free as possible, so that none may be lost in the smelting.

Fly, a two-winged insect. The word is used in compounds, as may-fly, stone-fly, butterfly etc., but when used alone is correctly applied only to two-winged insects. They belong to a natural order called *Diptera.* In the broad sense the mosquito, gnat and midge are flies. The common house-fly is the best-known representative. The apple-worm is the larva of a fly. Other injurious plant-eaters are the onion-maggot and the Hessian fly. The sting of the gall-fly produces a gall on plants, in which the eggs are deposited and the larvæ reared. Bat-flies infest cattle. Flies are very prolific and breed rapidly. They are useful as scavengers, and some are agents in the cross-fertilization of plants; but they also are agents in carrying germs of disease. There are about 200 species of gad-fly or horse-fly in this country. They include the strong, large flies common on wooded roads, and smaller ones, sometimes known as deer-flies, yellowish or greenish in color, a pest, annoying to both man and beast. In summer the eggs are deposited on stems and leaves, the larvæ live in earth or water. The common house-fly is found all over the world. Contrary to popular belief it does not bite, its mouth-parts not being fitted for piercing. The stable-fly, which closely resembles it, sometimes enters houses before rain and its bite is laid to the house-fly. The eggs of the latter are generally deposited in horse-manure, occasionally in decaying vegetables. They hatch in from six to eight hours into white maggots, which under favorable conditions reach full growth in four or five days. After five days of pupa stage the adult fly comes forth. In a single summer a dozen generations may appear, and when it is taken into account that one female lays an average of 120 eggs, the great numbers of the pest are readily understood.

Fly=Catchers, name of a group of perching birds, having the following characteristics: Size, small or medium; colors, dull; head large, sometimes crested; sedentary, solitary birds, never seen in flocks; not songsters, voices more or less pleasing; in obtaining food make a sudden dash after a winged insect then return to their perch; aggressive and fearless. The fly-catchers include the king-bird, wood-pewee, phœbe, Acadian flycatcher, great crested flycatcher, least flycatcher, olivesided flycatcher, yellow-bellied flycatcher and Say's flycatcher. See Blanshan: *Bird Neighbors.*

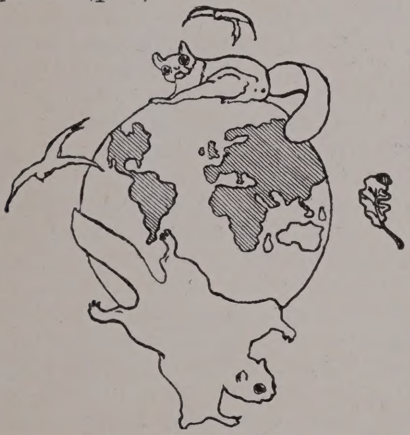
Flying=Fish, a fish capable of projecting itself from the water and sailing through the air. There are a number of fish, mostly in the warmer seas, that possess this power. They have large pectoral fins, that are spread as a parachute to sustain the body in the air, but are not used as wings. These fishes leave the water by the vigorous use of the tail-fin. They are rather small fishes, the largest species reaching a length



FLYING-FISH

of 16 or 17 inches. Statements differ as to the distance they are able to fly. President Jordan says that the large flyingfish of southern California sometimes flies for a distance of nearly a quarter of a mile, without rising more than three or four feet. See AERONAUTICS.

Flying Squirrel. The Flying Squirrel has, connecting his fore and hind limbs, an extension of the skin of his body and this, when he leaps through the air, is stretched and holds him up. First he drops straight down, then he descends obliquely—as you see him doing here—later assumes a horizontal position, flying straight ahead, and finally turns his course upward to the branch at which he was aiming. A bird achieves the same purpose by holding his wings rigidly and assuming an oblique or vertical position (as you see the little swallow doing at the top of the picture) when he is about to light. Autumn leaves, dried, stiffened and curved by loss of moisture, are carried through the air by air currents in a similar manner. When the flying squirrel is at rest these fur "biplanes" of his which, like the rest of his fur are as fine and soft as silk, are crumpled up like the fluting on little sister's "dress-up" apron. He flies most about twilight, and it is a matter of curious interest to note that the face is much more like that of a bat (*q. v.*) than that of the common squirrel (*q. v.*).



THE FLYING SQUIRREL: WHERE HE LIVES AND HOW HE FLIES

Flying squirrels are found in temperate and tropical regions all over the world with the exception of the islands of Madagascar and Australasia which you see are left unshaded. Madagascar was once a part of Africa and the Australasian islands a part of Asia, but all were separated by the sinking of the connecting land, before the days when flying squirrels were developed. See EVOLUTION.

Foch, (*fôsh*) **Ferdinand.** The appointment of General Foch as commander-in-chief of the Allies, was, like the Battle of the Marne, one of the epoch-making events of the European War. The Allies, fighting under independent commanders against a strongly centralized power were at a disadvantage, and the series of victories for the allied arms which followed very shortly after the choice of Foch as generalissimo not only confirmed the wisdom of the act but further demonstrated the brilliant ability which had already earned for him the title, "the first strategist in Europe." The United States not only threw the weight of its prestige into the scale in favor of this step, but General Pershing placed all the American forces then in France at the disposal of General Foch. Foch and Joffre came from the same corner of France, being natives of the Pyrenees near the Spanish border. Foch was born October 2, 1851. Like Napoleon, he was first of all a student of the art of war. Later he wrote books on military science, which not only placed him among the highest authorities on strategy but led to his appointment as head of the French War College. The brilliant work done by the French army in the war was largely due to the spirit which Foch instilled into all who came into contact with him either at the college or in the field. He is described as exerting a veritable fascination. He has the characteristic French facility of conveying a whole volume of meaning by a mere gesture; and, like most great soldiers, his words are few. Caesar's "Veni, vidi, vici" is typical. It might be said of Foch, as was said of General Pershing by a newspaper correspondent who tried to interview him on a subject about which he did not think it wise to express himself, "he knows how to be silent in seventeen different languages."

Focus, a term employed in optics. If a luminous point be placed anywhere on the axis of a lens or mirror, there is in general a second point on this axis at which the rays leaving the first point will again meet or from which they will appear to diverge. This second point is said to be the *conjugate focus* of the first point. If, however, the luminous point be practically at infinity, as, for instance, in the case of a star, then the rays which are incident upon the mirror or lens will be parallel to each other. The focus at which the rays meet in this case is called the *principal focus.* Mirrors can evidently have but one principal focus; but lenses have two, since the parallel rays may be incident upon either face of the lens. If the reflected (or refracted) rays actually intersect at a point, that point is called a *real focus.*

Fog, a cloud of very small particles of water suspended in the air near the earth. Fogs appear white because the water-particles are small and transparent. The principal source of fog is a moist soil with colder air above it. Another frequent source of fog is the passage of hot moist air over cold water; as, in the early morning over rivers and small lakes. Fogs cannot form except in air in which dust-particles are present, a nucleus of some kind being required before condensation can begin.

Folk'lore, the study of the popular customs, traditions and tales of a people. The systematic study and collection of old ballads and tales, with the recording of customs and ceremonials, began with the 19th century, though there had been some work done in this field before, as Percy's *Reliques of Ancient English Poetry;* Scott's *Minstrelsy of the Scottish Border* (1802). The *Home Stories* of the brothers Grimm (1812); Grimm's *German Mythology; Fairy Legends and Traditions of the South of Ireland* by Croker; *Popular Rhymes of Scotland* by Robert Chambers; and *Legends of the Punjab* are examples of the work already done. The Grimm brothers, who almost created this science, spent 13 years in collecting their stories from the lips of peasants. Not only have these collections been made in all countries, but folkfore societies have been formedl and several folklore journals founded. The English Folklore Society, founded in 1878, has its organ, *The Folklore Journal.* There are three folklore journals published in France, and a congress of students of the subject was held in Paris in 1889. The American Folklore Society, instituted at Cambridge, Mass., early in 1888, has for its object the collection of old English folklore, the lore of negroes in the southern states, of Indian tribes, the French folklore of Canada and the Spanish folklore of Mexico and California. The study of folklore is not entirely for amusement or curiosity. By comparing the records thus collected of ancient peoples and times, much is learned of the relation of races and languages to each other, thus adding to the materials for the studies of ethnology and philology. See *Custom and Myth*, Lang; *Myth and Mythmakers*, Fiske; and *Curious Myths of the Middle Ages*, Baring-Gould.

Fol'licle, a dry pod-like fruit which splits down one side. See FRUIT.

Fond du Lac, Wis., county-seat of Fond du Lac County. Lies in a fine farming district at the head of Lake Winnebago, has three railroads and manufactures lumber, sash, doors, blinds, agricultural implements, leather, boots and shoes, caskets, tents, awnings, refrigerators, furniture, saw-mill machinery, overalls, workshirts, typewriters, tables, dustless brooms and boats. The high school, court house, opera-house, Elks' Club, Masonic Temple, St. Agnes' Hospital, Grafton Hall (girls' seminary), Y. M. C. A., armory, postoffice and a number of churches are its principal buildings. It is lighted by electricity, has extensive waterworks, 25 miles of paved streets, and is noted for the excellence and number of its artesian wells. Population 26,000. Fond du Lac is an excellent example of the development of natural resources by business enterprise.

Fontaine. See LA FONTAINE.

Fontainebleau (*fôn'tăn'blō'*) a town in France, beautifully situated in the midst of a forest, near the left bank of the Seine, 37 miles southeast of Paris. It is chiefly famous for its chateau, the pleasure-palace of the kings of France. Founded by Robert the Good in the 10th century, it has been added to by almost every king of France, so that it bears the architectural style of almost every century. It was here that Pope Pius VII was detained a prisoner for nearly two years by Napoleon, and here also Napoleon signed his act of abdication in 1814. The forest surrounding the chateau covers 65 square miles. The modern city furnishes a great deal of wine and fruit for Paris, and has manufactories of porcelain. Population about 15,000.

Fontenoy (*fônt'nwä'*), a village in Belgium, the scene of a battle on May 11, 1745, between the French, 60,000 strong, and the English, Dutch and Austrians in equal force. After a hard fight the allies were forced to retreat, the loss on each side being about 7,000 men.

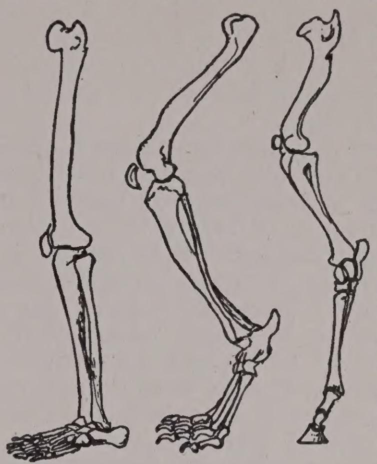
Foochow or **Fuchau,** the capital of the Chinese province of Fu-chien or Fukien is situated on Min River, 25 miles from its mouth. The town proper is surrounded with walls nearly 30 feet high and 10 feet wide at the top. The trade is principally in tea, the shipments in 1897-98 amounting to nearly a million pounds sterling or close upon six million Haikwan *taëls.* The imports are opium, cotton goods and lead, whose total value in 1905 was over seven million *taëls.* It was opened to foreign commerce in 1842, and is one of the largest mission-stations in China. Lines of the imperial Chinese telegraph connect Fuchau with Shanghai, Amoy, Canton and Ningpo. Population 624,000.

Food, that which nourishes. Foods are varied, those of the animal kingdom being vegetable and animal substances or products, together with certain mineral salts. In the broad sense water and oxygen are foods. Physiologists distinguish between foods and foodstuffs. A food is an article of diet that may be composed of one or more foodstuffs. For example, bread is a food, composed of starch, gluten, fat, water and various mineral salts, and the latter are foodstuffs. There are four main groups of foodstuffs: Starches and sugars, made of carbon, hydrogen and oxygen and called *carbohydrates;* butter, oils, fat and the like, made also of carbon, hydrogen and oxygen in different proportions and called *fats;* lean meat, white of egg etc., made of carbon, hydrogen, oxygen and nitrogen and called *proteids;* and water and mineral salts, called *inorganic foods.* Foods usually are insoluble and, when suspended in water, will not pass through a membrane. The object of digestion is to render them soluble and capable of passing in solution through membranes. This is different from assimilation, which consists of the processes by means of which the digested food is built into living tissue. Food is used to make good the constant loss that occurs in all living beings. It stands to reason that the food, in order completely to nourish the body, must contain all the chemical elements of which that body is composed. These chemical elements are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus and various other elements in very minute quantities. It will be seen, therefore, that proteid substance in some form must be a part of the food, in order to supply nitrogen since carbohydrates and fats contain only carbon, hydrogen and oxygen. Milk and eggs are good examples of complete foods. For physiological reasons a mixed diet is best. Green plants, unlike animals, are able to make use of compounds like water and carbon-dioxide, and, by means of the energy derived from the sun's rays, build these into carbohydrates, as starch and sugars. These may be used in conjunction with nitrates to manufacture their protoplasm, which is endowed with life. The construction of starch etc. requires energy, and, by the well-known law of conservation of energy, the substances thus formed are endowed with potential energy. The agent that enables plants to utilize the energy from the sun, is their green coloring matter (chlorophyll). Animals must start with complex substances already endowed with energy, and, therefore, require carbohydrates, fats and proteids. See Mineral Food Vegetable Chart, opposite page 1231, Volume IV; also Bread, Butter, Flour, Milk, Pure Food Laws.

Food, of plants, consists of materials suitable to be used, without the expenditure of much work upon them, for the formation and repair of the plant-body. Foods for plants therefore are essentially the same as for animals, which is to be expected because the protoplasm is alike in the two. The food of green plants is not different from that of others, but they alone have the power to make food in the green cells under the action of light. (See Photosynthesis.) No other living things possess this power; hence the world is dependent on green plants for its food and for all the fuel whose energy drives its machinery. Carbon-dioxide and water are not properly called plant-food, being the material out of which some foods only are made.

Fool. See Jester.

Foot, the part of the limb upon which an animal stands when resting. A comparison of the foot in various animals brings out many interesting modifications. The limbs are composed of corresponding parts, but there is great variation as to the development and the number of parts in contact with the earth. In the human foot we distinguish the ankle or tarsus, the instep or metatarsus and the toes or phalanges. The heel rests upon the earth, and this condition is called a plantigrade foot. Other animals, like the cat and dog, walk on the toes or digits, giving a digitigrade foot. The heel is up in the air and the instep is lifted away from the earth. In deer, cattle, horses and other animals the elevation of the heel has been carried further, and the animal stands on the tip-end of a single toe; the heel, instep and digits are away from the earth, the tip-end of one only being in contact. These points are illustrated in the diagram; in this comparison of the hind limb of man, dog and horse the heel-bone, to which is attached the tendon of Achilles, forms a landmark. It, of course, is to be understood that the fore limbs of dog and horse have undergone similar modifications. The deer, cattle and other animals have an even number of toes, while the elephant with five, the rhinoceros with three and the horse with one are odd-toed. The horse has the most remarkable example of a modified foot; not only are the heel and instep off the earth, but the bones of the instep have become reduced to one, and the animal walks upon the tip of a single toe on each foot of the four feet. It has been shown by fossils in the rocks that the horse's foot has been derived from that of an original five-toed ancestor, by suppression and consolidation of parts. The geological history of these changes extends over more than two million years. (See Evolution.) The word foot is also applied in zoology to the tube-feet of starfishes, the part of the body upon which snails and clams rest, the feet of crustacea, insects, etc.



FOOT

Foot'ball, an outdoor game of several varieties, played with a round or oval, inflated ball about 27 or 28 inches in circumference. The ball consists of a rubber bladder encased in a leather cover. The game is a very old one, and now has three main varieties: association-football, which is played extensively throughout the British empire; Rugby football, which originated at Rugby School, England; and American college-football, which is a local development of the Rugby game.

A form of Rugby football was introduced at Harvard University about 1870. It was soon taken up as an intercollegiate game, the rules altered from time to time by those meeting in the intercollegiate football conventions, and the distinctively American game evolved slowly. For present American football, ball is 28 to 28½ inches in circumference the long way, and 22½ to 23 inches the short way.

The field is 360x160 feet. Each goal line is 50 feet from center of field. Lines 5 yards apart parallel goal lines across field. Back of each goal line is an end zone 10 yards deep. Centrally on each goal line stands a goal: two upright bars 18 feet 6 inches apart, united by a cross-bar 10 feet high.

Winner of a toss of a coin has choice of goal or kick-off; if winner selects goal, loser has choice of electing or rejecting first possession of ball. Eleven men constitute a team. Suppose team A chooses goal, and B has first possession of ball. Team B spreads in single-line formation several feet back of its 40-yd. line. A player tees ball on line, and, with a short running start, kicks it as far into A's territory as possible. Team A spreads over its half of the field, and one member catches or recovers ball and dashes forward, team-mates guarding. When a team fumbles a ball, the side recovering it has possession. Team B players, at kick of ball, rush forward to tackle or guard. Only player with ball can be tackled. Strict rules forbid piling. Teams now line up in scrimmage formation where ball is downed. Each team has a center, and, generally, lined on both sides of him are a guard, tackle, and end, shortly back of whom are the quarter-back, right and left half-backs, and full-back. Teams may re-arrange scrimmage line and back formations at will, but offensive team must have seven men on line of scrimmage when ball is put in play. Team A's quarter-back now calls a series of numbers indicating play to be made, and center passes ball backwards between his legs to designated man in rear, who runs forward as far as possible, protected by the "interference" of his team-mates against attack, or passes ball to another team-mate, who attempts to proceed. Center puts ball into play, except after score due to touchdown or field goal. If team A does not make a 10-yd. gain in four attempts, possession of ball goes to team B. If team A gains 10 or more yards in four or a lesser number of attempts, it is privileged to try to repeat its success. If team A does not succeed in advancing the ball satisfactorily during the first three attempts, it may punt: center passes ball to player 10 yards back, who kicks or punts it as far down the field as possible. Team B receives ball, and carries it as far forward as possible—or until it is downed. Team B now has possession, and begins attack in scrimmage formation. The forward pass is another means of advancing ball. Center passes ball back to player, who makes a throwing pass to one of his own team-mates who seems most likely to escape immediate attack. If last player catches ball, he proceeds until tackled. If he fails to catch before ball touches ground, attempt is counted a down, and ball is put into play at place from where play originated. If an opponent catches ball before it touches ground, possession goes to his side, and he carries ball as far towards other goal as possible—or until downed. Suppose team B carries ball over A's goal line. This counts B 6 points. B now may attempt 1 point more. In scrimmage formation a B player may attempt to kick ball over horizontal bar at a distance of not less than 5 yards from goal line. Or team B may attempt to gain the 5 yards by line bucking, side running, forward passing or other play, in any case having only one try.

But suppose B has brought ball to place about 20 yards from A's goal, and does not believe it can proceed. It may try a field goal: center passes ball to player standing several yards back. On receiving, player drops ball, kicking it as it touches ground, making a drop kick. If ball goes over horizontal bar, B is credited with 3 points. Team B might also attempt kick from placement: Player with ball lies down, holding ball suspended between hands while a team-mate tries to kick it over the bar, 3 points attending success. Or, on receiving a punt, player may make no attempt to advance, but put ball in play by drop kick or any other legitimate play. After all completed scoring ball is brought to 40-yd. line of scoring team.

Time: 1 hour of ball in play. There are four quarters of 15 minutes each, with 1 minute rests after first and third quarters, and 15 minutes between second and third quarter. Two of the more frequent penalties are 15 yards for "holding" a defending player, and 5 yards for being "offside," i. e. crossing line of scrimmage before ball is put in play. Officials are: referee, who has general charge; umpire, who watches conduct of players; linesman, who marks gains and losses; field judge, who assists other officials.

ASSOCIATION FOOTBALL : MODERN SOCCER

Modern soccer, also called association football, is becoming a great sport among American schoolboys; in the lower grades it is substituted for regular football.

Association football is older than Rugby or American football, and is the great popular English game, drawing crowds of thousands of people to its most important matches. The ball used is round; it is played almost entirely by kicking it, the players not being allowed to carry it, and a score of 1 point is secured by sending it between goal posts of the opposing team, under the cross-bar. Posts are 24 feet apart, the cross-bar 8 feet high. Once in motion the ball is propelled by kicking it, by striking it with head, shoulders, or any part of the body except the arms, and play is continuous until score is made except in cases of injury, fouls, ball kicked out of bounds, etc. The game is becoming very popular in American schools. Time: four quarters, 15 minutes each. The players consist of one goal-keeper who alone is allowed to touch the ball with his hands, two backs, three half-backs and five forwards.

Foote, Andrew Hull, an American naval officer, was born at New Haven, Conn., in 1806. He entered the navy in 1822, and was appointed captain in 1849. In 1856 he carried by storm four forts at Canton, China. On the outbreak of the Civil War he organized and equipped the western flotilla, and in February, 1862, stormed Fort Henry. His services obtained for him the rank of rear-admiral and a vote of thanks from Congress. He died at New York on June 26, 1863. See his *Life* by Prof. James Hoppin.

MARY HALLOCK FOOTE

Foote, Mary Hallock, American novelist and artist, was born at Milton, N. Y., on Nov 19, 1847, and lived for some years in Colorado, Idaho and California. She then studied art in New York, and did much work in black-and-white for magazines and book-illustrations. Her residence in the west seems to have impressed Mrs. Foote, and led her to attempt the delineation in fiction of frontier and mining life, and of scenes steeped in local color, characteristic of the west. Her success has been great, especially in such stories as *The Led-Horse Claim*, *John Bodewin's Testimony; Cœur d'Alène;* and *The Chosen Valley.* Other romances and novels include *In Exile and Other Stories, The Cup of Trembling, A Story of a Dry Season, The Last Assembly Ball, The Desert, The Sower, A Touch of the Sun* and other stories.

Forage-Crops. See FEEDING-STUFFS.

For'aker, Joseph Benson, United States senator and jurist, was born near Rainsboro, O.. on July 5, 1846. When the Civil War broke out, he enlisted in an Ohio regiment and served throughout the struggle, gaining the rank of first lieutenant and brevet-captain. In 1869 he graduated at Cornell University (N. Y.), and, being admitted to the bar, practiced law at Cincinnati and was elected judge of the Cincinnati superior court. Resigning in 1882, from ill-health, he became active in politics, and from 1886 to 1890 was Republican governor of Ohio. In 1896 and in 1902 he was elected to the United States senate, where his ability as a debator and constitutional lawyer gave him prominent rank. He died in 1917.

Forbes-Robertson, Sir Johnston, one of the most distinguished actors of his day, was born in London, England, in 1853. Originally trained to be an artist, he went on the stage at 21. He was at one time a member of Sir Henry Irving's company, and also was leading man to Mrs. Patrick Campbell. In later years he starred in *Hamlet, Macbeth, The Passing of the Third Floor Back*, and *The Light That Failed.*

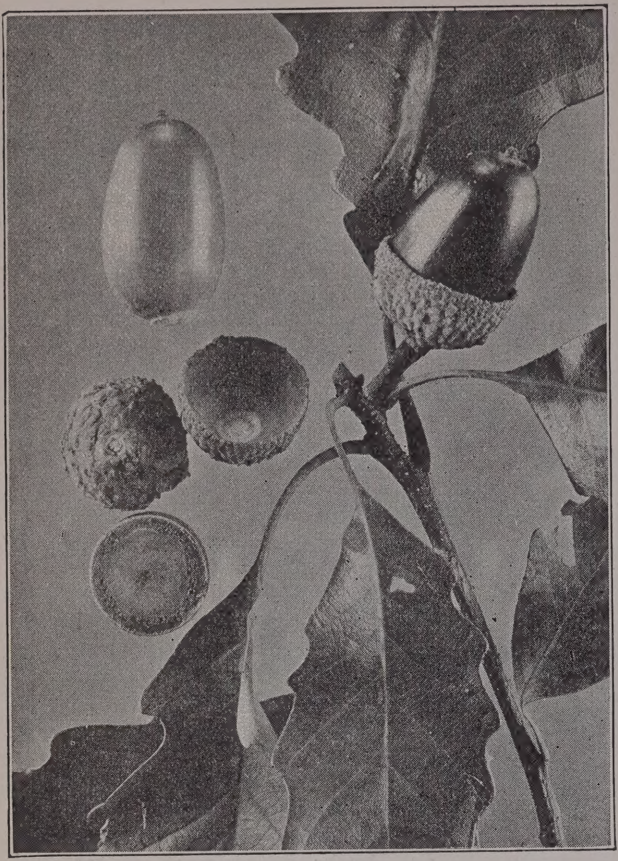
Force, in physics, always means the product of *the mass of a body* and *the acceleration of the body.* If we denote the mass of a body by m and its acceleration by a, then the force F, which is acting upon the body, is given by the following defining equation:

$$F = ma.$$

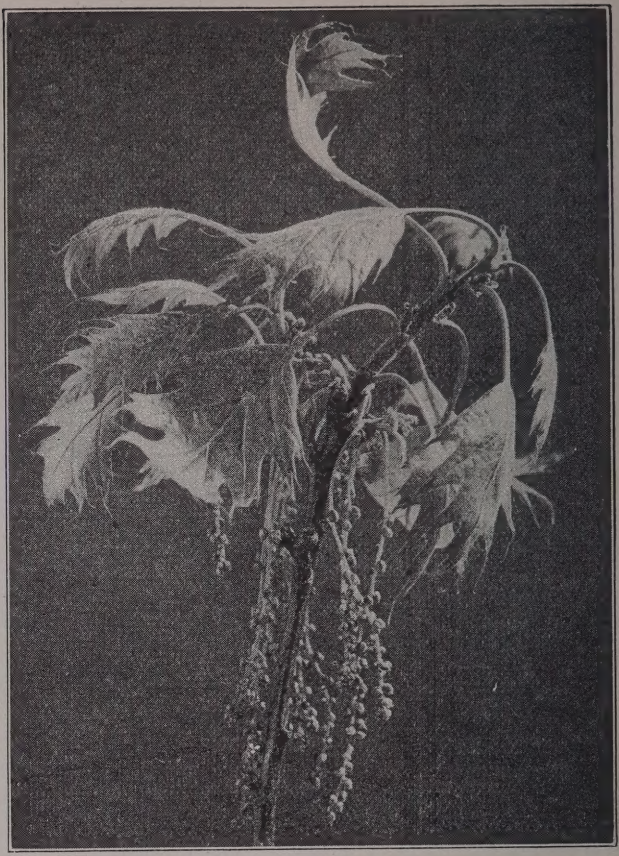
Strictly equivalent to the preceding definition are the following two: *Force is the time-rate at which the momentum of a body is changing;* and *Force is the space-rate at which the energy of a body is changing.* Sometimes force is assigned an objective existence, and is spoken of as the *agent* which changes the momentum of a body. But, so far as is known, the only things in nature which have an objective existence are *matter* and *energy.* The physicist, therefore, prefers to use force merely as a measure of a certain ratio, namely, the rate at which momentum changes in the time. It is important for the student to observe that the momentum of a body may be changing even while the body is at rest, as is the case with a pendulum-bob at the end of its swing. In like manner a body may be in rapid motion and be acted upon by no force, as is the case with a pendulum-bob when passing through its lowest point.

Moment of force is a quantity which plays the same rôle in rotation that force plays in translation, and it is defined in a strictly analogous manner. Moment of force acting upon any body is measured by the product of the *moment of inertia of the body* and the *angular acceleration* of the body. Or, what is the same thing, moment of force is the time-rate of change of the angular momentum of the body. Or, still again, moment of force is the angular rate at which the energy of the body is changing. For *unit of force* see DYNE and DYNAMICS.

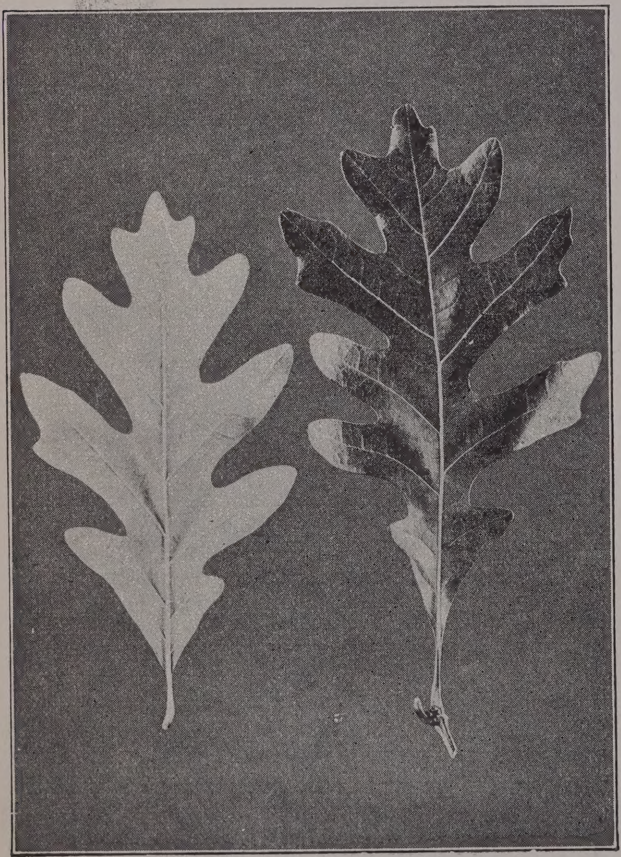
Ford, Henry, American inventor and manufacturer, without question the most famous maker of automobiles in the world. He was born in Greenfield, Mich., in 1863, attented the district school, and became a machinist. About 1896 he began to experiment with horseless carriages operated by steam, and in 1895 he built the first gasoline "Ford." The Ford Motor Company, which he organized in 1903, rapidly reached a point where it made more automobiles than any other company in the world. By standardizing the design and developing large-scale production, it was possible to reduce the price and place it within the reach of millions who could not afford higher-priced automobiles.



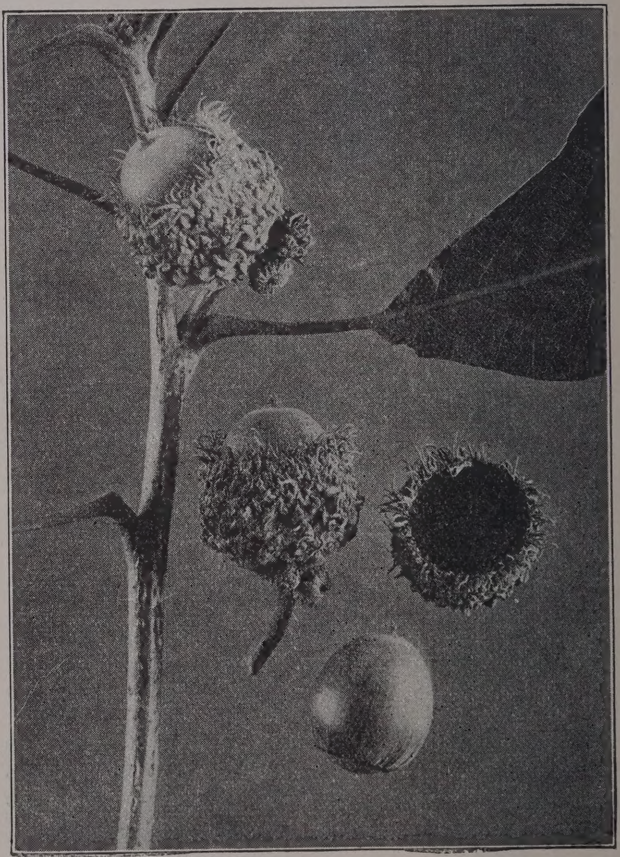
CHESTNUT OAK.



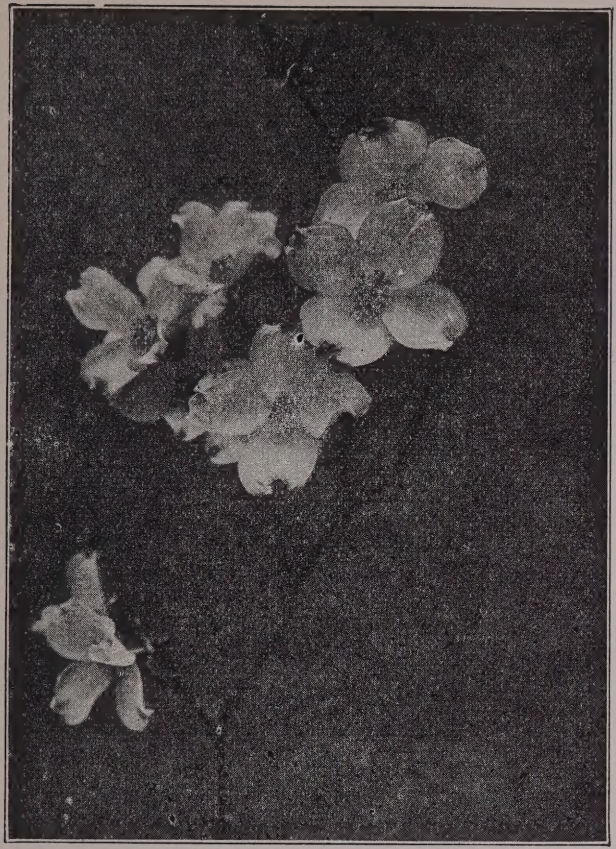
RED OAK.



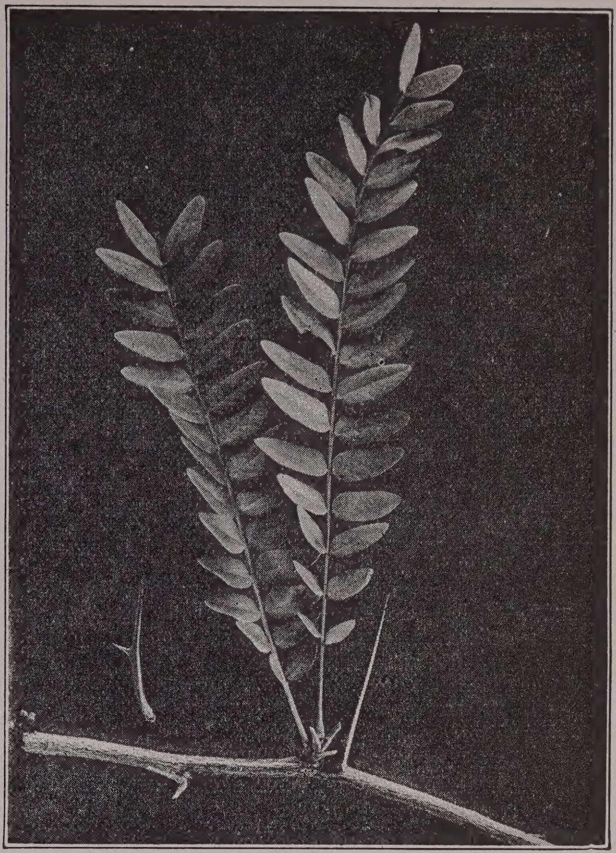
WHITE OAK.



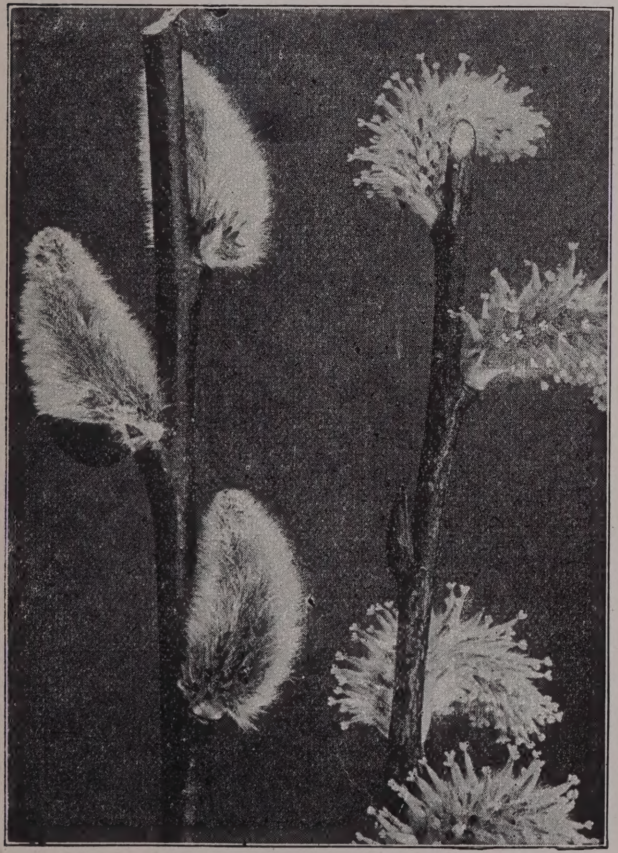
BUR OAK.



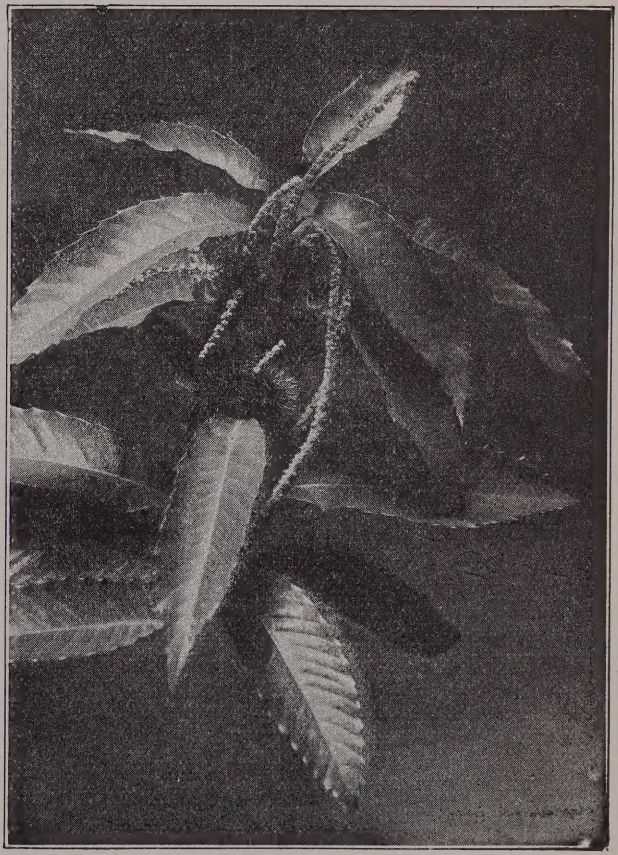
DOGWOOD.



HONEY LOCUST.



PUSSY WILLOW



CHESTNUT.

3—10

Ford's ideas on economics and politics drew almost as much public attention as the fact that he was the only rival of John D. Rockefeller for the position of the world's richest man. The high wages paid in his plant, his financing of the "peace ship" in 1915, the radical policies supported in his weekly paper, *The Dearborn Independent*, his contest with Truman Newberry for the senatorship from Michigan in 1920, called upon him a mixed shower of praise and ridicule.

For′est. Forests may be considered as the climax of the world's vegetation, but conditions favoring their development do not exist everywhere. There are many types characteristic of different regions. The prevailing type of temperate regions is the deciduous forest. Sometimes it is nearly pure, as in beech-forests, oak-forests, etc.; but the more common type in the United States is the mixed forest, consisting of a mingling of numerous trees, as maple, elm, hickory, oak, beech, walnut, poplar, gum, etc. The deciduous forests of the United States are much finer than those of Europe, where the varieties are not so numerous and the trees are not so well-developed. Coniferous or evergreen forests are common in mountain regions and on sterile soils, extensive forests of this kind occurring in the lake-states, gulf-states and in the western mountains. The greatest of all forests are in the rainy tropics, as in the Amazon region, where the forests form jungles dripping with moisture, the trees being interlaced with vines and covered with air-plants. The scientific handling of forests is called forestry, (see FOREST-SERVICE) which involves not so much the preservation of forests, as proper care and cutting, by means of which they may be preserved and still yield the timber necessary for the world's use. A division of forestry has been organized by the Department of Agriculture in Washington, which has charge of this subject in the United States. Foreign countries, as France and Germany, are far in advance of the United States in the proper management of forests.

Forest-Reserves are areas reserved for the preservation of forests and the protection of other natural resources. They are withdrawn from occupation, except conditionally. The national reserves are called national forests, and number 160 in the United States, including four in Alaska and one in Porto Rico. There are four state-forests.

The law as to national forests encourages every industry that will not jeopardize their safety and maintenance. Each is subject only to restrictions that prevent waste and injury to the forests. Any settler can obtain $20 worth of timber a year for home-purposes free. The forester marks the trees, and the pioneer cuts them. Should the settler need more than $20 worth, he files an application, and in 1911 over 40,000 such free-use permits were issued. Only mature trees may be cut. They must be so cut as not to hurt young growth. Tops and brush must, if necessary, be burned. Cutting must begin within six months from the date of the permit, and be completed within a specified time. For municipal and mining purposes the government grants rights of way. It also issues grazing permits; lets cattle be driven through the forests between pastures outside; and builds driveways for stock in reserves where grazing is not allowed.

Location and Acreage of National Forests.

Arizona	13,883,452
Arkansas	1,184,012
California	21,104,069
Colorado	13,408,138
Florida	318,960
Idaho	18,139,435
Kansas	156,376
Michigan	84,011
Minnesota	844,473
Montana	16,192,504
Nebraska	521,065
Nevada	5,424,254
New Mexico	9,810,522
North Dakota	6,224
Oklahoma	61,028
Oregon	13,740,139
South Dakota	1,073,760
Utah	7,201,695
Washington	9,914,314
Wyoming	8,420,497
Total	141,488,928
Alaska	26,643,260
Porto Rico	32,975
Grand Total	168,165 163

California has the largest, North Dakota the smallest, national forests. The New York reserves are mainly in the Adirondacks, but partly in the Catskills; the Pennsylvania ones at the heads of its three principal rivers.

Forest-Service is a branch of the Department of Agriculture that cares for the national forests and also promotes forestry throughout the country, forestry being the art of growing forests and keeping them up. The service originated in 1897 when Mr. Cleveland was president, and until Feb. 1, 1905, was under the Department of the Interior. It comprises the office of the forester and four branches. These are operation, silviculture, grazing and products. The forester's office includes inspection, law, information and dendrology, the science that deals with the natural history or life-story of a tree. Operation includes maintenance, accounts, organization, engineering and lands. Silviculture includes extension, silvics and management, silvics being the science that treats of a forest. Grazing includes control and development. Products include wood-utilization, wood-preservation and publication. The forester is Henry S. Graves, and his force in 1911 numbered 2,624 men. Positions are filled by civil service examinations, and technical qualifications of a high order are required

The work was begun because our forests are disappearing so rapidly that it is calculated that they will be exhausted within 20 years. Another reason for trying to save them is that the water-supply and the soil depend on the forests. Where forests abound, the rain falls often and is kept a long while by the forest-soil, which is a kind of sponge, so that the streams have a steady supply and the flow and depth are regular. Where forests have been destroyed, the rain falls irregularly and flows away in floods at once. These cause great loss, and carry the soil away. This is called erosion, and a billion tons of fertile earth are taken to the sea every year by our rivers, while these themselves remain shallow and fill with stones and sand. So the saving of the water, on which agriculture, irrigation, the making of electricity, inland navigation, mining and even manufacturing all so largely depend, is a chief aim of the forest-service, as well as the preservation of a permanent supply of timber.

Already efficient protection for forests has increased the flow of their streams 25 *per cent.* Grazing lands, in the national forests, that had been almost ruined have begun to recover. Fire, the forest's worst foe, is so successfully fought that in 1907 only one eight-hundredth of the forest reserves had a fire, though their area is over 158,000,000 acres, and only three ten-thousandths were destroyed. At the same time new kinds of timber are being brought into use, with new ways of using and preserving old kinds, and the states and the private owners of forests are assisted in many ways.

Forge, a fire intensified by air-blasts. Forges formerly were generally made of bricks, the air being forced up beneath the fire by means of a bellows. They now are made of wrought or cast iron, and may be moved about from place to place. In former times forging was one of the most important arts in engineering and required expert workmen, but the steam-hammer and other like inventions of the present day have made forging a mechanical work. One of the largest forging machines in the world makes 600 to 1,200 strokes a minute.

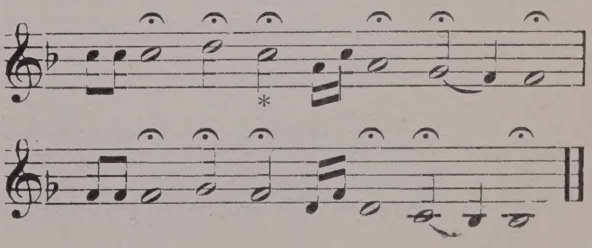
Forget=Me=Not, a term applied to a flower of which there are many species, and accounted for by various legends. The flowers in the common forget-me-not are small, have five petals and are of a medium shade of blue.

Form, in music, a term of as wide application and significance in music as in philosophy. From a very common use forms of music may be classified according: (1) to the character of the tonal embodiment or mode of expression, *i. e.*, vocal and instrumental, choral and orchestral; (2) function in social and religious life of peoples, *i. e.*, secular, ecclesiastical, religious; (3) inner character or nature of the subject defined, *i. e.* lyric, dramatic, programatic; (4) structural ordering, *i. e.*, contrapuntal, polyphonic, monophonic, binary, ternary, first-movement, rondo, cyclical; (5) melodic material, *i. e.*, monodic — one primary melody with various modes of accompaniment; polyodic — each accompanying melody having a true and characteristic melodic significance, for example, Chopin's *Étude in C-sharp minor*; monothetic — one theme, treated in various ways in all the voices, as in the canonic and fugal forms; polythetic — more than one theme, as in the double and triple fugue, the suite, sonata, etc. Each of these classes contains a variety of individual forms, *i. e.*, vocal includes many types of song, the chorus, oratorio, part-song, madrigal, glee, etc. Under ecclesiastical heading are to be classed the hymn-tune, choral, mass, liturgical forms like the Gregorian tones, chants, responses, etc. and Bach cantatas.

Strictly speaking, form applies to two distinct aspects of musical conception; first, to the anatomical or architectural ordering of the rhythmic, harmonic and melodic content; second, to the plastic, the æsthetic molding of the tonal expression of the melodic and harmonic ideas through the application of rhythmic nuances, dynamic intensities, shadings and accents, modes of articulation and the wonderful varieties of tone-color. Hold a leaf to the light and look *through* it, and there is seen a very complex system of the individual elements of ribs, veins, cellular tissues, etc. in characteristic relations; that is the structural, architectural design, form and unity of the leaf appealing to the intellect. Look again *at* the leaf and note the beauty of its rhythmic outline and symmetry, the warmth of its coloring and the delicacy of its aroma; that is the plastic, the æsthetic, the vital form reaching the heart. No work of art is of value that does not involve both these conceptions of form, and he only is an artist who, in conception and expression, realizes the beauties both of the structural and the æsthetic form of a work of art, be the art what it may — in this case, music.

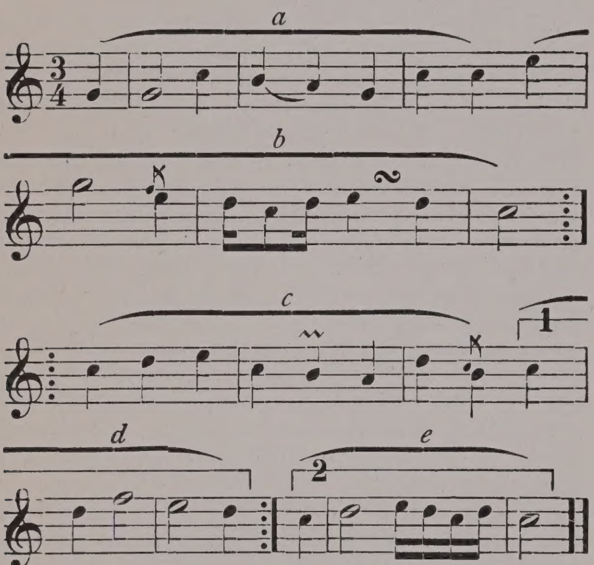
A few simple melodies will suffice to illustrate the primary elements of structural form in music. We will begin with the tribal prayer of the Omaha Indians.

EXAMPLE I



In this most tenderly beautiful choral we have the first simple melodic unity. Two melodic ideas, *a*, *b*, called phrases, are made clearly apparent through harmonic and melodic progression. The first cadence at * involves the definite conception not only of progression but of necessity for a succeeding phrase, expressing a definite relation — in this case, a sense of antithesis. The two phrases stand, therefore, in the relation of thesis and antithesis, and the unital idea may be called a strain. Strain, therefore is a primary form — a *norm*, used in the structural development of music; just as the unity of subject and predicate, called a sentence, whether represented by single words or phrases, is a structural element of poetry; and the arch, a structural element of architecture. In the following old French song, *Gabrielle Charmante*, the phrases *c*

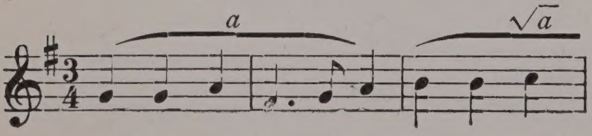
EXAMPLE 2

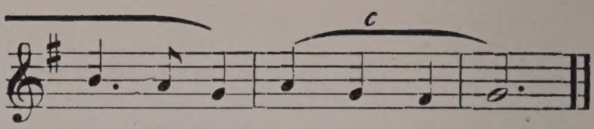


and *d* constitute a strain of a somewhat different character from the strains *a* and *b*. The second phrase (*d*), because of cadential treatment, expresses this idea of a complementary rather than an antithetical phrase to *c*. Phrases *c* and *e* are decidedly thetical and antithetical, as also phrases *a* and *b*. The strain, therefore, may be in two forms, according to whether the two terms (phrases) are relatively thesis and antithesis or thesis and complement.

Each of these terms, thesis or antithesis, may be strengthened by some form of reiteration, one illustration of which is found in the first strain of *My Country, 'tis of Thee.*

EXAMPLE 3

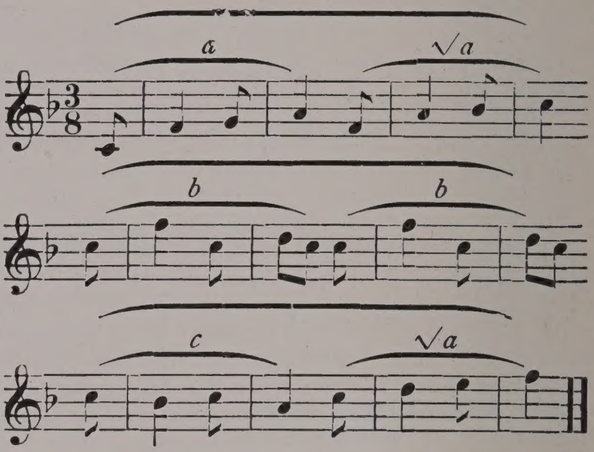




The thetical feeling of phrase *a* is strengthened by phrase √*a* not so much by the likeness in melodic design as by the rhythmic and especially by the cadential reiteration. This strengthening of the thetical element of the strain is quite common. The reiteration of the antithesis also occurs, but more rarely.

A very different form of two-phrase structure is illustrated in the following old folk-song:

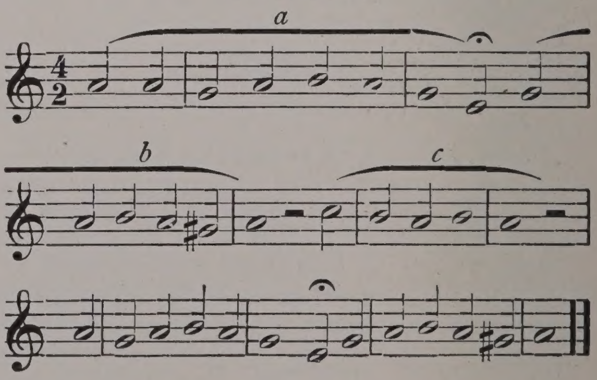
EXAMPLE 4



Phrase √*a* is clearly a modified form of *a*, and closes with a like cadence. The two phrases, however, constitute a distinct unity, the second phrase not being a mere repetition. Such a two-phrase structure may be termed a couplet. A couplet involves a thesis and some modified form or intensive reiteration of the thesis, with definite cadential relations. Like the strain, the couplet is an elementary unit of thought — a norm. Unlike the strain, the couplet always is a dependent idea, while the strain may be dependent or constitute a completely independent melodic idea as in Example 1.

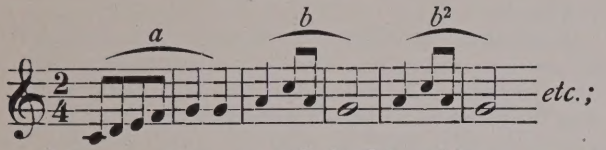
Another unit of thought — a norm — is illustrated in the following old German choral:

EXAMPLE 5



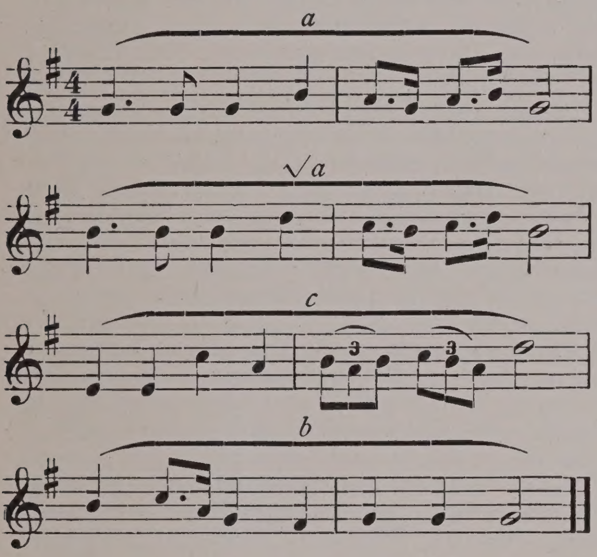
In this example a single phrase is used as a distinct unit of thought, standing in somewhat the relation to the preceding *a b*, and succeeding a^2, b^2, strains, that the second couplet, *b b*, in Example 4, sustains to the couplet *a a* and strain *c a*, between which it stands. In the following old folk-song the phrase as a distinct unit of thought is used in the form of an echo:

EXAMPLE 6



and in the chorus of *Hail Columbia*

EXAMPLE 7



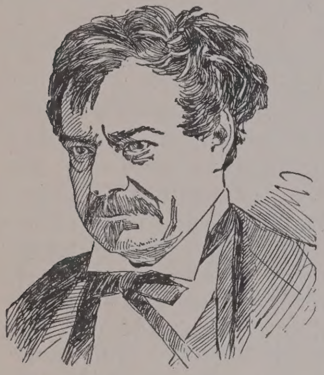
it is used to build up a complete stanza-form. It is also to be met with as a kind of parenthetic interpolation and as a refrain. The strain, couplet and phrase, then, are the primary units of thought involved in all the large structural and æsthetic forms of music.

In a simple way we see how the melody of Example 1 is a compound idea, for the second strain is not a repetition, but an æsthetic development, a more intense, more deeply solemn utterance of the spiritual significance of the prayer. This greater impressiveness is the result of the relation in tonality of the two strains and the tone-stratum in which the second strain is sung. The first strain is clearly in the dominant key, and the second in the tonic. This is a specimen of a rare type of what is called binary form, to be found, so far as the writer is at present aware, only in very simple primitive folk-songs like the above. A second more common type of binary form is illustrated by Example 2, when the second part is developed out of new melodic material. The most common type of the binary form, however, is where the second strain, stanza or strophe introduces new melodic material in relation with that derived from the first part. This is frequent in two-strain folk-songs and the simpler folk-dances, especially in their idealized forms, *i. e.*, Bach's minuets, written for children.

In Example 4 are to be discerned three distinct parts, the third of which is a repetition of the first. This is termed the ternary (three-part) form. This type of structural design is probably more commonly followed than any other. If space permitted, it could be shown that, in general, this design is the essential basis of well-developed fugues, dances of all kinds, the so-called first-movement form, the rondo, the finale and the aria.

It remains to point out one more highly significant form, illustrated in a most elementary way by Examples 7 and 5. In this form the ideas (in Example 7 phrase-units, and in Example 5 couplet and strain-units of thought) follow one another with ever-increasing intensity of interest and spiritual force, embodying, like the sonnet, that poetic form which it most closely resembles, the innermost "holy matters" of the heart, such as may appear only in "a letter [song] from the poet [singer] marked 'confidential.'" Bach's first Prelude in *The Well-Tempered Clavier* is a most simple but wonderfully significant and beautiful specimen. C. B. CADY.

Formo'sa or **Taiwan**, an island, now belonging to Japan, lying off the coast of China, having a length of 235 miles and a breadth of from 70 to 90 miles. Its area is 13,458 square miles. The highest mountain is Mount Morrison, 12,487 feet high. The island is famous for its vegetation, many of our rarest hot-house plants growing wild on its mountain-sides and in the valleys. Camphor and teak-trees, pines, firs, bananas, bamboos and palms are there in profusion. There are 43 species of birds peculiar to the island, and fish are plentiful along the coast. The principal products of commerce are tea, sugar, coal, camphor, rice, sweet potatoes, bamboos and rattan. The island was ceded by China to Japan in 1895. Taiwan, which is a treaty-port, is the capital (population 50,000); and the other chief towns are Tamsui and Kelung. The population of the island is estimated to be about 3,392,063, including about 50,000 Japanese. Its commerce is now largely with Japan, though there still is considerable trade with China, as also with the United States. There are 230 miles of railway, besides 125 miles of a light railway line; there is also a telegraph service with 88 offices open and over 1,100 miles of line. Its mineral resources are being developed, including gold, silver, coal, petroleum and sulphur. In 1905 the exports amounted in value to 60 million *yen* (the *yen* having a value of about 50 c.); while there was a like volume and value of imports. The Japanese administration has effected much improvement in the way of sewerage, water-works, the establishment of hospitals and schools, as well as manufactures. The camphor-industry, together with the fisheries, has been extended, in addition to its agricultural interests. See Guillemand's *Cruise of the Marchesi*.


EDWIN FORREST

For'rest, Edwin, a celebrated actor, was born at Philadelphia March 9, 1806. He first appeared on the stage in 1820, and at 20 played as Othello in New York. He appeared with success in London in 1836 and 1837, but injured his reputation there by hissing Macready. He made his last appearance in the part of Richelieu at the Globe theater, Boston, in 1871, and died of paralysis on Dec. 12, 1872. His acting of Lear, Othello and Coriolanus was greatly admired. With him the line of great American actors began. See *Life* by the Rev. W. R. Alger.

Forrest, Nathan Bedford, a Confederate general, was born in Bedford County, Tenn., on July 13, 1821. He raised a cavalry regiment at the outbreak of the Civil War, and was engaged in the battle of Shiloh. He was an able and daring cavalry leader, commanded the cavalry at Chattanooga and fought at Chickamauga. In April, 1864, he captured Fort Pillow; was promoted to be lieutenant-general in 1865; and surrendered at Gainesvillen on May 9 of the same year. Forrest died at Memphis, Tenn., Oct 29, 1877.

Forrest, Sir John, LL.D., explorer and administrator, was born in Western Australia on Aug. 22, 1847. Entering the surveying department in 1864, he was assigned the command of the expedition which went in search of Dr. Leichhardt in 1869. The following year he commanded the expedition from Perth to Adelaide along the shores of the Great Australian Bight. In 1874 he headed the 2,000-mile journey without camels from Champion Bay to the overland telegraph line between Adelaide and Port Darwin through the center of Australia. For this achievement he received a substantial reward from the government and the gold medal of the Royal Geographical Society. Sir John was the first premier and treasurer of West Australia under responsible government, leaving this office to become minister of defence of the Commonwealth of Australia (1901-1903), then taking the ministry of state for home affairs, which he held until 1904. He was responsible for the building of the great harbor at Freemantle and for the water-supply for the Coolgardie gold fields. He has published *Explorations in Australia* (1876) and *Notes on Western Australia* (1884 to 1887).

For'ster, William Edward, an English Liberal statesman, was born in Dorsetshire on July 11, 1818, and died at London on April 5, 1886. He was of Quaker ancestry, and was educated at the Friends' school in Tottenham. Settling at Bradford, he engaged in the manufacture of woolens, in which he made a large fortune. In 1861 he entered Parliament and took an active interest in education; was vice-president of the council of education; and carried through the elementary educational bill of 1870 and the ballot-law under the Gladstone administration. In 1874 he visited the United States, and on his return was elected lord-rector of Aberdeen University. In 1880 he became chief secretary for Ireland in Mr. Gladstone's cabinet, and sought to grapple with Irish affairs; but, owing to disagreements with his chief on his leniency toward Parnell and the Land-Leaguers, whom he sought to coerce by drastic legislation, he resigned, and thereafter was at issue with Gladstone over his Irish policy. He was held in high esteem in Parliament for his honesty and independence of character, though from Irish partisans he earned the title of Buckshot Forster from the severity of his views in respect of Irish sedition.

Fort Dodge, Iowa, county-seat of Webster County, on the Des Moines River, 90 miles northwest of Des Moines. Railroad connections are furnished by the Chicago Great Western, Illinois Central, Minneapolis & St. Louis, and the Fort Dodge, Des Moines & Southern, an electric line. It has good schools, churches, two colleges, and a Catholic Seminary. Its industries include one of the largest oatmeal-mills in the United States, coal-mines, gypsum-quarries, and clay industries. A former fort here was called Fort Clarke. Population, 19,310.

Fort Don'elson, an historic post in Tennessee, on Cumberland River, 12 miles east of Fort Henry. It was strongly fortified by the Confederates during the Civil War, and in 1862, when held by General Floyd with 15,000 troops, was attacked by Commodore Foote, who was driven back. But the forces of General Grant, coming up from the capture of Fort Henry, defeated the Confederate force, which came out of the fort to meet them. General Floyd and a part of his force escaped during the night, and the following day General Buckner, who was next in command, surrendered with about 14,000 men.

Fort Fisher, Battle of. In December of 1864 General Grant sent an expedition against Fort Fisher, which commanded the entrance to Cape Fear River, below Wilmington, North Carolina. The force consisted of 6,000 troops under General B. F. Butler and a fleet of ironclads under Admiral Porter. After a bombardment, which continued for two days, an assault was attempted on Dec. 24, but was abandoned without serious fighting, the works being deemed impregnable. General Grant was dissatisfied with the result, and two weeks later sent General Alfred H. Terry with 8,000 men and a fleet, as before, under Admiral Porter to renew the attempt. Under cover of a bombardment by the fleet, the troops were landed on Jan. 13. The next day the works were stormed, and after a desperate and bloody hand-to-hand struggle, they were carried. Two thousand prisoners and 169 heavy guns were captured.

Fort Francis is on Rainy River, one mile from Rainy Lake (Ontario), and on the main line of the Canadian Northern. It is the Canadian terminus of the Duluth and Rainy Lake and Minnesota and International railways. It also is the terminus of the Rainy River Navigation Company. There is a fine waterpower at this point (Alberton Falls) where 30,000 H. P. are being developed.

Fort Henry. See Fort Donelson.

Fort Madison, county-seat of Lee County, Iowa, is 18 miles from Burlington. In 1832 the town was established and took the name of the fort built there in 1808. Chief among its manufactures are agricultural implements, automobile tires and shoes; the city also has flour and lumber-mills, railroad-shops and pork-packing establishments. It is served by the Atchison, Topeka and Santa Fe and the Chicago, Burlington and Quincy. Population, 9,890.

Fort Moultrie is on Sullivan's Island, situated at the entrance to Charleston harbor, South Carolina. It was first built of palmetto-logs and earth, mounting 26 guns, and was unsuccessfully attacked by a British fleet of nine vesesls, mounting 270 guns, in 1776. It was afterward rebuilt in masonry. In the Civil War it fell into the hands of the Confederates, when Major Anderson abandoned it for Fort Sumter in December of 1860.

Fortress Monroe, a fort built on Old Point Comfort, Virginia, to defend Hampton Roads and the approach to Norfolk. It has within it detached buildings for officers' quarters, barracks, storehouses, arsenal, workshops, the artillery school etc. It can mount 187 guns. The fortress is six-sided, and is surrounded by a wet ditch, outside of which are batteries. It covers 80 acres, and cost $2,818,000. It is the largest fort in the United States.

Fort Scott, Kan., the capital of Bourbon County, on Marmaton River in southeastern Kansas, 96 miles south of Kansas City, is the center of a region rich in bituminous coal, cement-rock deposits and extensive flagstone-quarries. The chief revenue is derived from its two railroad-shops, which employ more than 1,000 hands. Besides, there are manufactories of brick, machinery and syrup. Fort Scott is the largest horse and mule-market of the state. The buildings, chiefly those of the national and county governments, are substantial and commodious, and the city is attractively situated. For some reason, however, its population has not grown in the past decade: it now numbers 10,463 inhabitants.

Fort Smith, Ark., a city on the Arkansas River, on the western confines of the state and adjoining Oklahoma. Here is a United States military reservation devoted to educational purposes, and the city school system consists of nine schools with 85 teachers and 3,500 pupils. It lies 160 miles northwest of Little Rock, and is the seat of the United States district-court of the western district of Arkansas. Its factories include mills, iron-foundries, machine-shops, furniture and wagon-factories etc. It is served by seven railway-systems. Population 32,000.

Fort Sumter, a fort built on an island near the entrance to the harbor of Charleston, S. C. When fully equipped, it was to have 140 guns in three tiers; but at the close of 1860 it had not been finished. In December of that year Major Robert Anderson, who was in command, transferred the garrison of Fort Moultrie, only 109 men, to the new fort, on learning that he was unsafe from attack in the old fort. He could mount only 52 light guns. From January to April, 1861, the fort was, in fact, besieged, as President Buchanan had refused to hand over the South Carolina forts to the state government. On April 11 the South Carolinians demanded the surrender of Sumter; and, on this being refused, notice was given that the bombardment would commence at four o'clock the next morning. The fort was seriously damaged by the firing from the shore, which lasted for several hours, but no one was hurt. As provisions and ammunition had given out, Anderson agreed to abandon the works, which he did on April 14. The firing on Fort Sumter was the beginning of the Civil War. The works were stubbornly held by the Confederates till Charleston itself was abandoned in February, 1865, and during the war they were the city's chief defense. The fort was, however, bombarded by a Federal monitor fleet, and later by batteries on Morris Island, and shot into a shapeless ruin.

Fort Wayne, the county-seat of Allen County, in northeastern Indiana, is 148 miles southeast of Chicago. It is situated at the head of Maumee River, covers nearly 19 square miles, and is the second city of Indiana in population. It is an important steam and interurban railway-center, has a large number of manufactures, including knitting-mills, car-wheel and machine-shops, agricultural implements and electrical apparatus, oil tanks and pumps, shirt waist and glove factories, steam-engine works, etc. It has fine public buildings, many school-buildings and churches, and is the seat of a Catholic bishopric. Concordia College, a flourishing institution of the German Lutheran church, is located in Fort Wayne. The city is called the key to the Lake Region of Indiana. The population is about 115,000.

Fort William, situated on the north shore of Lake Superior, is four hundred and twenty-seven miles east of Winnipeg, at the mouth of Kaministiquia River. The river affords a natural harbor where vessels drawing twenty feet of water can sail for five miles, and both of its banks can be used for manufacturing sites. The city's population is about 35,000. It is the lake terminus of the Canadian Pacific and of the Grand Trunk. It also is on the Canadian Northern. The whole northwest is dependent on Fort William for the outlet of its products. Its growth is rapid and safe. Large sums are being spent by the government for improving its harbor, to better the facilities for handling the ever increasing business of the Canadian marine. The Olgilvie Flour-Mills Co., the Canadian Iron and Foundry Co. and other large industrial concerns are located here. The amount of merchandise brought into Fort William by vessel for transshipment is immense.

Fort Worth, a city and important railroad center in northern Texas, county-seat of Tarrant County, lies where the West and Clear Forks of Trinity River flow together, about 170 miles north of Austin. Twelve trunk-line railways make the city an important shipping and manufacturing center. It is the largest terminal grain market in the South. The discovery of oil has made it an important refining city, with many pipe lines radiating to other centers. Fort Worth is the largest live-stock market in the South, and one of the largest in the nation. Surrounding the city is a great cotton belt. It was the first city in the United States producing helium, the non-inflammable gas used in inflating dirigibles. Lake Worth and artesian wells give an ample supply of water. There are several skyscrapers over twenty stories high in the city, whose growth has been remarkable. Among the schools are Texas Christian University, two colleges and twelve private schools. The city is a center not only for trade and higher education, but also for milling and manufacturing. The city possesses an excellent public-school system, several business colleges and a medical school. There are rolling-mills, iron-foundries, a jute-factory, a woven-wire factory and manufactories of flour, cotton and woolen goods, leather etc. There was but one house within the city-limits in 1872; the number of its inhabitants in 1876 was only a little over 1,000. The population, which in 1900 was 26,688, is at present 200,000.

Forth, a river and firth of Scotland. The river is formed by two head-streams, the Duchray and the Dhu, rising within a mile of Aberfoyle and not far from Ben Lomond. The Firth of Forth extends 51 miles eastward from Alloa to the German Ocean. Its waters are from three to thirty-seven fathoms deep. In 1882–89 a great railway bridge was built across the firth at Queensferry, being one and a quarter miles in length.

For'tifica'tion is the military art of strengthening a place against the attack of troops. There are two branches, called field and permanent fortification. Field-fortification includes such slight intrenchments and field-defenses as can be thrown up by the troops themselves during the few hours before a battle, as well as fieldworks requiring days or weeks to build. Permanent fortification deals with engineering works for the defense of points of importance. Years may be spent in finishing them, and iron and masonry are largely used in building them. Field-fortification, while aiming at giving the defenders of a chosen position all the advantages of cover from the enemy's fire and of forcing him to advance over open ground swept by their fire, must also allow free movement for counter-charges. A position is made ready for attack by loopholing any buildings, which may stand on it, and the walls around them, strengthening the cover afforded by ditches and hedges along the front or by throwing up breastworks and digging rifle-pits, with deep trenches in the rear for supports and gun-pits for artillery. Parts of this line should be so placed as to flank an attack on the front, and no cover should be left for the enemy during his advance. Hollows, which cannot be seen from the front, should be filled with brushwood. To oppose the advance of the enemy an abattis is often used. This is a row of tree-branches, sharpened and laid with points outward. Entanglements are also used; either of brushwood cut halfway through and woven together with wire run through it or of several lines of barbed wire fastened to stakes. Only the more important points of such a position are really fortified by building field-redoubts, usually in the form of a square, forming strong points in the main line, advanced posts in its front or a second line of works in the rear. Often redoubts have only two sides meeting at a point in front; or they may be five-sided —two in front called the faces, two on the flanks and in the rear a lower side called the gorge. The faces and flanks are formed by parapets (meaning "guard the breast"), twelve to sixteen feet thick, to resist artillery. The gorge is shut in usually by a light parapet, say three feet thick, or by a stockade (a wall of bullet-proof timber). In building a redoubt a ditch is made in front. Sometimes sharp palings, called palisades, are planted in the bottom. The top or crest of the parapet is never more than twelve feet above the ground in a field-redoubt. Fieldworks of this kind can be built in from eighteen to twenty-four hours, and are able to withstand the fire of field-guns. Blockhouses are now only used in mountain-warfare, where artillery could not be used and timber is plentiful.

Permanent fortification, for the defense of cities, harbors, tracts of country, bridges, roads and the like goes back to the earliest times. Its aim formerly was to keep out the enemy, unaccompanied by counter-attacks, except sorties to destroy siege-works and batteries. Since 1859 detached works and free maneuvering ground between them for counter-attack have been used for permanent works as well as for field-intrenchments. This is due to the great improvement in artillery and small arms, cannon easily destroying the strongest works at long range and the breech-loading rifle increasing the power of armies in the open field.

In Greek history we read of cities surrounded with walls of brick, stone and rubble. Babylon had a wall of enormous length, 100 feet high and 32 feet thick, surmounted by towers. Jerusalem at the time of Vespasian's siege had like walls. But the square and round towers which had been defense enough against arrows, and the walls which had withstood battering rams, were soon found to be useless against cannon. Early in the 15th century the Italians began to flank their walls with bastions (built like the outer faces of a redoubt). This form of defense was carried to great perfection by the great Vauban, the engineer of Louis XIV. He built 33 new fortresses, improved over one hundred and himeslf carried on more than fifty sieges. Vauban's forts were in the shape of a polygon. The main body of the place is called the enceinte. Bastions are built out, and joined by a parapet called a curtain. A rampart is formed of the earth dug from the ditch, and a parapet is built on it. To protect the flanks an outwork on the far side of the main ditch is built, called the ravelin. As cannon became more powerful, the masonry had to be covered by what are called counter-guards. The enceinte or main fortification at Antwerp was fortifications at Antwerp also showed how the science had changed, outworks close to

The quick penetration by the German siege guns of the walls of Antwerp, which represented the best modern construction in this form of defense, was a revelation. It demonstrated that fortifications built at enormous expense are less effective for purposes of defense than the ditches and improvised works used wherever long lines were stretched across country.

It had not previously been regarded as practicable to transport field use guns of such enormous caliber. These guns were transported in sections and put together and mounted on solid concrete foundation before being brought into action.

In a similar way the use of the aeroplane in military operations did away entirely with the old strategy of surprise; a strategy as old as war itself, and in which Napoleon achieved such extraordinary triumphs.

A seaport or dockyard must be fortified in a different way from an inland town, as the heaviest guns can be brought against it by the enemy's ships, and it can now be bombarded at a distance of ten or more miles. The first line of defense is made of submarine mines. To protect these, shore batteries are thrown up, able to drive back a landing party. Electric lights to discover the position of the enemy, guard-boats, swift steamers to scout in front and torpedo-boats are necessary. For the real defense the heaviest guns to be had are mounted. See *Military Engineering* by Prof. D. H. Mahan.

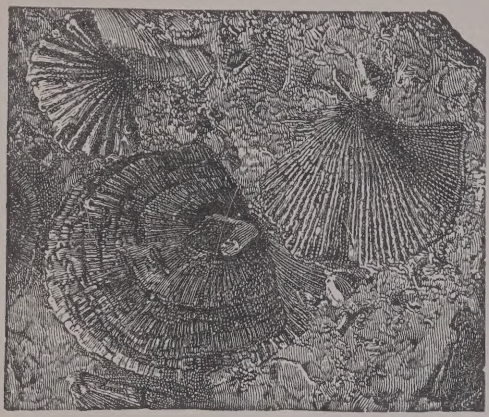
Fortu'na, called by the Greeks Tyche, was, in mythology, the goddess of chance. Pindar considers her a sister of the Fates. She differed from them, however, in working without law, conferring joy or sorrow as she pleased. She had temples at Smyrna, Corinth and Elis, and two statues of her at Antium were consulted as oracles. Greek poets and sculptors represented her with a rudder, with a ball or wheel or with wings. The Romans proudly said that when she entered their city, she threw away her ball and put off her wings and shoes, to indicate that she meant to dwell with them forever.

Fortune Bay, an electoral district of Newfoundland. Population (1901) 8,762; chief towns: Belloram, Garnish, Harbor Breton, Pushthrough and Bay d'Argent.

Fortuny y Carbo (*fôr-tōō'nê ê kär'bô'*) **Mariano,** an eminent Spanish painter, was born at Reus, in Catalonia, in 1839, and studied at the Academy of Barcelona and in Italy. He was a vivid portrayer of domestic life in the east. Among his best-known works are *The Spanish Marriage* and *Academicians Choosing a Model.* He died at Rome on Nov. 21, 1874.

Fo'rum, the name applied by the Romans to a public space, especially to the marketplace in a city, where public affairs were discussed, courts of justice held and money transactions carried on. In Rome the name was applied particularly to the famous *forum*, the low, level space extending from the foot of the Capitoline Hill to the northeastern part of the Palatine.

Fos'sil. The body, the bones, the shells or any part or distinct trace of any animal or plant buried in the earth by natural processes is a fossil. Fossils need not be of great age, and the youngest are of recent origin. In some cases the bodies of the fossils, plants or animals are preserved. Trees buried by wind-drifted sand become fossils, though the wood is almost completely preserved. The bodies of mammoths have been found in the frozen earths of Siberia, the flesh still undecayed. They likewise are fossils. More commonly only the hard parts of animals, as the bones, teeth, shells etc., are preserved. In many cases even the substance has been replaced by mineral matter of a different sort. Thus, the lime carbonate of shells may be replaced by iron pyrites or some other substance, and the form of the shell reproduced in the new substance is a fossil. The woody matter of buried trees is sometimes replaced by mineral matter, as silica, and the structure of the wood is reproduced in the mineral substance. Wood which has been thus transformed is petrified. In other cases buried shells are dissolved out of their setting, and there remains only a cavity (mold), having the shape of the shell, to indicate its former presence. In still other cases the shell may be filled with sand or mud, and this filling may become hardened. The shell may then be dissolved, leaving the filling or cast. This also is a fossil. The tracks of animals made in sand or mud and preserved by burial or the impressions left by leaves buried in the sand or in mud are also fossils.


FOSSIL

For a long time these petrified remains of animals and plants were not understood. During the middle ages the most curious ideas were held regarding them. The ones most commonly observed at that time were the shells of animals no longer existing, and they were asserted to be discarded molds of the Creator or abortive creative attempts into which the breath of life was not introduced. Lionardo da Vinci, in the early part of the 16th century, had understood their true nature, declaring them to be the remains of ancient life. But this was forgotten, and it remained for Cuvier to announce it again at the close of the 18th century. Large bones were being exhumed at this time near Paris, and Cuvier, from his extensive knowledge of anatomy, showed that they belonged to animals no longer living. The fossils are of importance in telling the past history of life on the globe. If we gather those from the oldest rocks, we get an idea of the earlier forms, and the others in later-formed rocks, taken all together, show the succession of animal life in geological times. Many of the fossil forms are entirely extinct. Other forms lived on, underwent modifications and developed into the animals of to-day. Within the past years the knowledge of fossil life has been greatly extended through explorations, and students of animal life are making out the lines of descent of our different modern animals. O. C. Marsh, E. D. Cope and other Americans made extensive and remarkable contributions to our knowledge of fossil life. Much attention is paid to the restoration and reconstruction of fossil forms. The work in this direction that has been done at the American Museum of Natural History in New York city is noteworthy. Not only have reconstructions of lost parts been made, but picturesque restorations of the entire animals, by the artist, Mr. Knight, under the direction of Professor Osborn. The science of fossils is palæontology (which see). See *Harpers' Magazine*, Vol. XCIV., p. 674 (1897), *The Century*, Vol. LII., p. 705 (1896); *McClure's Magazine*, Vol. XV., p. 512 (1900); Cope, *Tertiary Vertebrates*, U. S. Gov. (1884); *Am. Nat.*, Vol. XXII. (1898).

JOHN W. FOSTER

Fos'ter, John Watson, American diplomatist, was born in Pike County, Ind., on March 2, 1836, and graduated from the University of Indiana. After taking a law-course at Harvard, he practiced law at

Evansville, Ind., where the also was postmaster for a time. He distinguished himself during the Civil War as major and colonel of Indiana regiments. Subsequently he held diplomatic appointments, being minister to Mexico (1873–80), to Russia (1881) and to Spain (1883–85). In 1892 he succeeded Blaine as secretary of state, and in the following year represented the United States at Paris in the Bering Sea arbitration. He has also acted as plenipotentiary in the negotiation of reciprocity treaties, and has acted as peace-commissioner and envoy of the United States in international arbitration. His history of American diplomacy is a final authority.

Fos'ter, Stephen Collins, an American song-writer, was born at Pittsburg, Pa., in 1826. His compositions number 125, nearly a fourth being negro melodies. The best-known productions are *Old Folks at Home*, *Come where my Love Lies Dreaming*, *Uncle Ned*, *Old Dog Tray* and *Old Kentucky Home*. He died at New York on Jan. 13, 1864.

Fouche (*fōō'shā'*), **Joseph** (Duke of Otranto), minister of police under Napoleon, was born at Nantes, France, on May 29, 1760. He was elected to the national convention in 1792 and expelled in 1794. In 1799 he was appointed minister of police, and held the office until 1815. He was a man of one ambition—his own political success. He was indispensable to Napoleon, yet was dismissed by him twice, but reinstated each time. He was given office by Louis XVIII, but dismissed by him in September, 1815. He was then appointed ambassador to Dresden, and, being included among those who were banished, as having been concerned in the execution of Louis XVI, he henceforth led an exile's life and died at Trieste on Dec. 25, 1820.

Founda'tion, the base upon which a structure is built or placed, as the foundation of a building, a bridge-pier or an engine. The object is to furnish a base which shall not settle or, if it does settle in the least, that this settling shall be perfectly uniform. The best foundation-base is solid rock, as this is firm and not affected by water, but some gravels and clays are equally good, if they are not saturated with water. The most difficult soils for foundations are soft, compressible earths saturated with water. Where it is possible, it is best to go down until rock, gravel or "hard-pan" is reached. It is often necessary to go down 75 or 100 feet to find such firm material. Where the soil is of a yielding nature, the area of the base must be so enlarged as to decrease the pressure per square foot to safe limits. A common method in soft soils is to drive piles, saw them off at the surface and erect the foundation on a platform on these piles. The whole of the Back-Bay district in Boston is on pile-foundations. Sometimes masonry, concreted timber or iron platform foundations are used. Thus in Chicago, where the soil is boggy and it is impracticable to reach good rock, the foundations of many of the heaviest buildings have been erected on an iron and concrete platform. A cubical pile of crossed iron-rails is made and filled in with concrete, and the building is placed on these. For foundation-bases under water, or under soils saturated with water, coffer-dams and caissons must be used to get the masonry-work down to a firm base. (See COFFER-DAM and CAISSON.) The Romans seem to have been the first to make a serious study of foundations. It is said that the sites of the cathedrals of the middle ages were selected primarily with reference to getting a suitable foundation, and that, even so, many mediæval structures have disappeared on account of improper foundations. The subject of foundations is one of the most important problems of modern engineering, and it is often found necessary to spend large sums in preliminary borings to determine the character of the soils.

Foundry, an establishment for casting. Casting consists in pouring a molten metal into a suitably shaped mold in which it cools and solidifies, thus forming a metallic figure of the shape of the mold. Metal-casting is as old as civilization, but it has been greatly developed in very recent times. Most metals can be cast, but iron, brass, bronze, zinc, aluminium and type-metal are the metals most used for casting in the industries. The molds are formed of loam, molding-sand, plaster of Paris or metal. In type-founding, steel molds are used. To form a mold in loam or sand requires a pattern. This pattern is usually of wood, but may be of metal. Pattern-making for casting parts of machinery forms a special trade. Iron is melted for casting in a furnace called a cupola. The principle of foundry-work is simple, but the practice of it requires much skill and special knowledge, and special treatises must be consulted for details of the work of a foundry.

Fourier (*fōō'rĭ-ēr*), **Jean Baptiste J.,** a distinguished French physicist and mathematician, was born on March 21, 1768, and died at Paris, on May 16, 1830. He taught mathematics at Saint-Maur, at the Normal School and at the Polytechnic School in Paris, successively. In 1798 he went to Egypt with Bonaparte. Later he was appointed prefect of Grenoble in France, a position which he held for 14 years. It was while here that he wrote his immortal work on the *Analytical Theory of Heat*, which was published in 1822, and which has ever since remained a model in clearness and method for all writers on mathematical physics. It was this work which, six years after its publication, suggested to Georg Ohm, the German mathematician, the remarkably simple description of the manner in which electric currents flow through conductors, now known as Ohm's law. Fourier was quite as remarkable for breadth of culture as for special attainments in mathematics. At the same time with Cuvier he was life secretary of the French Academy of Science. He was created Baron de Fourier in 1808.

Fowl. See POULTRY.

Fox, an animal closely related to the dog and jackal, but distinguished by the sharp muzzle, erect ears, vertical pupil of the eye and long, bushy tail. There are several kinds, common in different parts of the world, with the exception of South America. The one most widely distributed in this country is the red fox, which resembles the common fox of Europe and Great Britain, but is distinguished by slight differences. This animal is about thirty inches in the body and head, and the tail is about a foot and one half long. Its fur is a reddish-yellow, with the tips of the ears and tail black and a white line on the belly. There are several varieties differing in slight details of color. It is a clever and cunning animal, being often able to elude the hounds in the chase. The blue or Arctic fox, which ranges southward to Labrador and Newfoundland, has beautiful silky fur, bluish or brown in summer and pure white in winter. The black fox or silver fox holds first place among fur-bearers; in London a single skin brought $2,784, and in this country skins not infrequently sell at from $600 to $1,200. The animal is jet-black, save for snow-white tip of tail and a few scattered white hairs low on its back.

CROSS FOX (a Variety of the Red Fox)

Fox, George, was the founder of the Society of Friends, commonly called Quakers, and was born at Fenny-Drayton, in Leicestershire, England, in July, 1624. At nineteen his religious convictions forced him into the belief that he was the subject of a special divine call, and, leaving home, Bible in hand, he wandered over the country, holding meetings. He not only was a great religious, but a great social, reformer. His dress, mode of speech and manners were different from others. He took off his hat to no one; addressed men and women as *thee* and *thou;* and opposed all unnecessary form in religious observance. He was persecuted and arrested, but the sincerity of his views was admitted. He visited America with Penn, Barclay and Keith. Fox was imprisoned numerous times. He spent three years in prison at Lancaster and Scarborough and more than a year in Worcester jail. Fox died in November 13, 1690. He was known as a lovable and Christlike man, with a heart full of love for his fellow-beings.

France, a republic of Western Europe lying between the Atlantic and the Mediterranean. It is bounded on the south by the Mediterranean and Spain, on the east by Italy, Switzerland, and Germany, on the north by Belgium and Luxembourg and the English Channel, and on the west by the Bay of Biscay and the Atlantic Ocean. Prior to the World War its area consisted of but 207,054 square miles. Since the Treaty of Versailles in 1919, however, its boundaries have been extended to include Alsace-Lorraine, and to-day France extends over an area of 212,659 square miles. The coastline of the Republic is 1,949 miles long, 700 miles of which lie in the north, 865 miles along the Atlantic and the Bay of Biscay, and 384 miles along the Mediterranean.

Surface and Drainage. The country is divided between the lowlands in the northwest and a large tableland which covers the southeastern half, and on the south and the southeast borders the slopes of the Pyrenees and Alps. The highest and most beautiful mountain in Europe west of the Caucasus, Mont Blanc (15,781 feet), is situated here. Several peaks of the Pyrenees in France rise more than 10,000 feet in height. To the north rise the Vosges, which run parallel with the Rhine, forming the boundary line between France and Alsace. Western and northwestern France abound in fertile plains relieved in their severity by the hills of Normandy and the cliffs of Britanny.

The tableland rises in some parts to about 4,000 feet, with deep river-valleys and mountain chains. The plain slopes toward the Rhône and the Mediterranean, fringed by the Cevennes Mountains. This chain of mountains separates two widely different regions: the fertile, sunny and warm plains of the Rhône and Languedoc and the plains of the Rouergue, dreary, cold and high, where only rye grows and flocks of sheep find rich grazing grounds. Central France is the highest part of the tableland, a region of granite gneisses and slates, with many extinct volcanic cones surrounded by wide sheets of lava.

The passes of Mont Cenis and Mont Genèvre lead into Italy, as does also the famous Mont Cenis tunnel.

The principal rivers of France are the Seine, the Loire, the Garonne, and the Rhône. The longest of these is the Loire which flows out into the Bay of Biscay over a course of 650 miles. The waterways of the Republic total 7,543 miles in length, 3,031 miles of which are covered by canal. Just beyond the naval base, Toulon, extends the famous Riviera, distinguished for its scenery and mild climate.

Production and Industry. Since the close of the World War, France has undergone, like most of her European neighbors, an industrial reconstruction, and in like manner has suffered from the economic depression which gripped the world. Pre-war factories have been replaced with new and larger scale factories fitted with the most modern of technical equipment. Among the most important industries are the textile, woolen, linen, and silk industries. Owing to the extreme length of its coastline the fisheries are of great importance. All industries connected with furniture, dress and articles of luxury are active and show the artistic taste for which the people are noted. Valenciennes, Chantilly and Alençon laces, Sèvres and Limoges porcelain and Aubusson carpets are examples of the productions of this class, while in the manufacture of jewelry few places in the world can rival Paris.

In 1929, there were 31,988,239 acres of arable land in France (including Alsace-Lorraine). The principal crops, with the harvests in thousands metric tons for 1932, were wheat, 9,018.2; oats, 5,129.4; potatoes, 15,868.1; sugar beets, 7,024.2; and barley, 1,168.7. There were 3,800,000 acres of vineyards in 1932 from which the production totalled 1,320,900,000 gallons. The harvest of apples and pears in 1931, in metric tons, was 226,870; plums, 23,602 tons; peaches, 25,334 tons; apricots, 7,119 tons; cherries, 57,981 tons, and nuts, 49,317 tons.

According to the livestock census of 1932 there were 2,919,700 horses; 240,970 asses; 143,600 mules; 15,433,840 cattle; 9,844,690 sheep; 1,488,120 goats, and 6,397,970 pigs.

It has been estimated that France has a coal reserve of eighteen billion metric tons. The richest coal fields are to be found in the Pas de Calais and Lorraine. In 1931 there were 23,420,000 tons mined at Pas de Calais. Lorraine also abounds in iron ore which has been mined here since the year 807. In 1932 the mineral output in thousands of metric tons was: coal, 47,258; pig iron, 5,459.8; and steel, 5,515. Ninety-one blast furnaces were in operation in 1933. Among the other mineral deposits of the Republic are bauxite and aluminum.

There is a great abundance of building materials and quarry products within the confines of the Republic. An excellent quality of marble is produced from the quarries in the Alps and Pyrenees. France is surpassed only by Great Britain in the production of roofing slates which are found chiefly in the Ardennes.

Transportation. There were 41,365 miles of national roads in France in 1930, 5,615 miles of departmental roads, and 346,865 miles of local roads. Construction of railways has been left to companies, superintended, and assisted, should it be necessary, by the State, in accordance with the law of 1842. By a Convention made on June 28, 1921, concessions were granted to six great companies, the State guaranteeing to them working expenses and the interest and redemption of capital and loans. On January 1, 1931, there were 25,964 miles open to traffic.

Population. According to the census of 1931 the total population of the Republic numbered 41,834,923, exclusive of 93,928 soldiers and sailors abroad in that year. The foreign population totalled 2,890,923. The French people combine many races. Those of southern France may be called "Iberio-Celtic," while the inhabitants of northern France are "Teuto-Celtic."

The principal cities, with their populations in 1931, are: Paris, 2,891,020 (Great Paris, which includes the city's suburbs, 3,783,000); Marseilles, 800,881; Lyons, 579,763; Bordeaux, 262,990; Nice, 219,549; Lille, 201,568; Toulouse, 194,564; St. Etienne, 191,088; Nantes, 187,343, and Strasbourg, 181,465.

Government. Since 1870, at which time Napoleon III was overthrown, France has enjoyed a republican form of government. The constitutional law of 1875, which confirmed this new form of government, was partially modified in 1879, 1884, 1885 and 1889. Legislative power rests in the Chamber of Deputies and the Senate. Executive power rests in the President of the Republic and the Ministry. The President is elected for seven years.

Members of the Chamber of Deputies are elected for four years, and to-day is composed of 615 Deputies. The Senate is composed of 314 members elected for nine-year terms. Both houses must remain in session at least five months out of twelve. The Republic is divided into ninety departments for administrative purposes. The unit of the local government is the commune.

History. The earliest historian of France was Julius Cæsar, who invaded and conquered the country in 58 B. C. It was then called Gaul, and the people were mainly Celts. It covered not only France, but Belgium and parts of Switzerland and Germany. At the time of Cæsar's invasion the Gauls had towns and fortifications, knew the arts of embroidery and working metals, and had made improvements in agricultural implements. They were a rough, savage people, however, their females slaves, their prisoners barbarously treated and their religion idolatry, with the sacrifice of human victims. After Gaul became a part of the Roman empire it was gradually civilized and in the second century A. D. it was the most populous of the Roman provinces. The Roman power yielded to that of the Franks, a Germanic tribe, under Clovis in 481. Paris was his capital. This first dynasty was called the Merovingian. Under Charlemagne, the second ruler of the second dynasty, called Carlovingian, which began in 751, France was raised to a high position in western Europe. The real founder of the French monarchy, as distinct from the Frankish kingdom of Charlemagne, was Hugh Capet, count of Paris and Orleans, who was made king by the feudal chiefs in 987. The Norsemen, however, had already seized what now is Normandy, and in the twelfth and thirteenth centuries their Anglo-Norman descendants owned far the greater part of France. For many years the kings of England laid claim to the crown of France. Hence the enmity between the two countries; the crusades and the Crimean war being the only instances of a military union between them. Normandy, Maine, Touraine and Poitou were taken back from France (1180-1223). With Philip VI (1328-50) came the house of Valois, which succeeded to the throne by the Salic law, which had come down from the Franks and excluded women from royal power. From 1339 to 1422 France suffered from the long though intermittent struggle with England in which took place the battles of Crécy (1346), Poitiers (1356), and Agincourt (1415). Louis XII, the Father of His People, and Francis I wasted the resources of the country in fruitless efforts to establish their claims on Lombardy. Francis I in his wars with Charles V secured Burgundy (1544), and Henry II recovered Calais. Under Francis II the Catholic house of Guise became powerful; while the reform movement was headed by their opponents, the house of Bourbon. The massacre of St. Bartholomew (1572) under Charles IX did much to weaken France.

Henry IV of Navarre (1589-1610), the first of the Bourbon princes, was succeeded by Louis XIII, who, influenced by Richelieu, sided with the Protestant princes in the Thirty Years' War, and he by Louis XIV (1643-1715), in whose reign the French monarchy reached its highest point of luxury and power. He extended the borders of France to the Rhine, and art, literature and science flourished to a degree unknown before; but the revocation of the edict of Nantes (1598) sent 400,000 of its best citizens from France. In the reign of Louis XV Corsica was added to France, but by the peace of Paris (1763) the larger part of the French colonies was yielded to England. Louis XVI, a well-meaning but weak prince, succeeded to a weakened throne. The spirit of the time, the success of the American War of Independence, the sufferings of the people and the oppressions of the nobles all united in the Revolution which broke out in 1789. In January, 1793, the king was beheaded; a reaction set in; and the people, wearied of bloodshed, were anxious for peace, and a general amnesty was declared in 1795. The state was governed by three consuls, Napoleon Bonaparte being the first, after the directory, to fill that office. At the head of the French army he gained the battle of Marengo. By the peace of Lunéville the boundaries of France were once more extended to the Rhine. In 1804 Napoleon was declared emperor by the vote of the people. In his victorious career he made himself king of Italy, made Holland and Naples vassal kingdoms, set up in Germany the Confederation of the Rhine, conquered Prussia, occupied Portugal, deposed the Bourbons in Spain, made Rome a French town and carried off the pope to Fontainebleau. With 1811 came a turning point in his fortunes; he was defeated in 1814; Paris capitulated to the allies and Napoleon retired to Elba. Louis XVIII (1814-24) succeeded to the throne, his reign being soon interrupted by the return of Napoleon, who met his final defeat at Waterloo. Charles X and Louis Philippe end the long line of French kings, the Revolution of 1848 overthrowing the latter. Louis Napoleon was in 1848 elected president of the new republic, but assumed the powers of a dictator by the *coup d'état* of December, 1851, and a year later, by a vote of the people, became emperor as Napoleon III, reigning nearly twenty years. The Franco-German War (1870-71) was begun by him as a vent for the growing discontent of the people; but the French army lost battle after battle, until at Sedan the emperor, with 83,000 men, surrendered to Prussia. France, following this disastrous outcome of the revival of imperial rule, again became a republic.

Following Bismarck's resignation in 1890 an alliance was formed between France and Russia, due to a mutual desire to counter-balance the growth of German power. It was in pursuance of this treaty that France, when Germany declared war on Russia, mobilized her army. England having settled her territorial disputes with France in 1904, with Russia in 1907, there resulted a friendly understanding called the "Triple Entente," although there was no formal alliance. The agreement with Russia settled disputes over the relative "spheres of influence" of the two countries in Persia; that with France secured the recognition of French claims in Morocco in exchange for non-interference with England's occupation of Egypt.

Since the year 1929 religious and military reactionary activities against the republican institutions of the Third Republic have been leading towards one important event in the political life of France. February 9, 1934, marks the date of that important event. On that day Gaston Doumergue, at the request of President Lebrun, accepted the Premiership of France. The Republic has been passing through a critical period, the events of which were deciding the fate of France. The crisis was reached on February 6 and 7. Although the immediate cause of the February revolution may have been the Stavisky affair, the general cause must be attributed to a general dissatisfaction which has been steadily growing for over a period of more than five years. The reactionary activities of the malcontents were stimulated by the "indifference of the Republican parties of the Left, namely the Radical Socialists and the Socialists." Each of these parties has been intent on gaining power for itself. It was through the influence and support of the reactionary faction that M. Doumergue was elected President of France in 1924. The reactionaries were conscious of the fact that their ends must be gained through political manoeuvring since a military dictatorship would meet with tremendous opposition from the French people. During his term as President of the Republic, M. Doumergue exerted his every effort to check the prerogatives of parliament and the Chamber of Deputies. When he failed, however, to support the aims outlined in the policies of the reactionary groups, the latter turned to M. Tardieu and M. Chiappe for more able support.

In December, 1933, Alexander Stavisky, a native Russian adventurer and director of the municipal pawnshop of Bayonne, absconded with spurious pawnshop bonds valued at approximately 400,000,000 francs ($25,000,000). He was known throughout France as M. Alexandre. The political difficulties, which were destined to arise out of the Stavisky affair, were due to the accusations against prominent French officials, notably Albert Dalimier, Minister of Colonies in the Chautemps Cabinet, and the French police, of complicity in the fraud. Minister Dalimier resigned from the Cabinet on January 9. He was replaced in the portfolio by Lucien Lamoureux. On that same day M. Stavisky was found dead in a villa near Chamonix. The Stavisky affair was declared a plot against the existing parliamentary régime and resulted in M. Chautemps' stout defense of the system of government. Paris became a scene of continuous rioting. The subsequent investigation of the Stavisky scandal resulted in further rioting over dissatisfaction with the manner of procedure. Disaster had covered France for many months. In December 1933, the railway wreck at Lagny snuffed out 200 lives. This was followed by the Stavisky affair and the wreck of the Emerald, a commercial plane, on January 15. The failure of the Government to conduct effective investigations into the disasters which have befallen France, tended to increase the discontent among the townsmen. Rioting in the streets of Paris revealed the insistent demands of the French people for a complete reorganization of government. On January 27, Premier Chautemps resigned, his Cabinet having enjoyed a career of two months. President Lebrun appealed to M. Doumergue to organize a new Cabinet, but the latter refused. On January 30, M. Edouard Daladier formed a new government, the organization of which resulted in an increased and more violent exhibition of disapproval from the public which seemed to forecast civil war. M. Daladier resigned on February 6. The alarming situation which was spreading throughout the Republic demanded the immediate formation of a Cabinet which would be capable of effecting an instantaneous cessation of all hostility. It was at such a time that Gaston Doumergue arrived in Paris and agreed to take over the responsibility of forming a coalition Cabinet. He chose the following Ministry:

Prime Minister—Gaston Doumergue
Deputy Prime Minister and Minister of Justice—Henry Cheron
Minister of Foreign Affairs—Jean Louis Barthou
Minister of Interior—Albert Pierre Sarraut
Minister of Finance and Budget—Louis Germain-Martin
Minister of Agriculture—Henry Queuille
Minister of the Colonies—Pierre Laval
Minister of Education—Aime Berthod
Minister of Commerce—Lucien Lamoureux
Minister of Posts and Telegraphs—Andre Mallarme
Minister of Air—General Victor Denain
Minister of Public Works—Pierre-Etienne Flandin
Minister of Public Health—Louis Marin
Minister of Labour—Adrien Marquet
Minister of Pensions—Georges Rivollet
Minister of Mercantile Marine—William Bertrand
Minister of Marine—Francois Pietri
Minister of National Defense and War—Marshal Petain
Minister of State—Edouard Herriot and Andre Tardieu

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GASTON DOUMERGUE
Former President and New Premier of France

The Doumergue Government petitioned the Chamber for extraordinary powers early in March when it requested that the Chamber of Deputies adjourn until May 15. On March 16, that request was granted when the Chamber returned a vote of 376 to 198. Unhampered by parliamentary criticism the Doumergue Government turned its attention to the task of reconstruction which confronted it.

Most pressing of the problems demanding the consideration of the new government was that of finance, a problem which has proved to be the downfall of at least three governments during the year 1933. The financial situation has, however, been greatly relieved since the appointment of a new government. The Bank of France has reported an increase of its gold reserve by 52,000,000 francs, an indication that the drain on the gold reserve of the country has somewhat subsided. The cessation of the outflow of gold is important in that it enables the government to carry on its intention to maintain the French franc on a gold basis, an intention which the public has for a time feared impossible to realize.

The budget of France shows a deficit of 4,000,000,000 francs. On March 29, the Cabinet approved economies amounting to 2,585,000,000 francs. These economies are concerned with the reduction of civil servants and a reducing of the salaries of those retained. Military, naval and air estimates were also reduced 300,000,000 francs. The policy of deflation being followed by the Doumergue Government has met with vehement outbursts of disapproval from the Ministers of Education and Labor and from the Central Committee of the Confederated Association of Public Servants.

M. Doumergue was hailed as "Saviour of France," and although rioting has subsided, the demands of the French populace for a complete governmental reorganization have been clearly recognized. The political stability of France must be re-established if the Republic is to endure. One of the first steps of M. Doumergue, acting in his Ministerial capacity, was to deprive Parliament of the right to discuss budgetary expenditures. On March 27, Premier Doumergue, in a radio-broadcast from the Quai d'Orsay in Paris said, "The Government's task is vast and arduous. It must first appease overexcited passions, and to do so promptly it must punish severely the guilty, whose impudence and immunity have very justly exasperated the whole of our nation, which is honest, upright and sound. The value of the franc must be maintained, it is low enough."

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February Riots in Paris

Bricks and cobblestones were hurled through the air by riotous civilians as they repulsed mounted mobile guards during the street riots in Paris.

The French War Veterans, a powerful group which has heretofore been non-political in nature, on March 25, abandoned their policy of neutrality and entered the political struggle which is sweeping over the French Republic. At the close of the three day national congress of the Federation of French Veterans' Associations it was disclosed that the veterans rejected a motion calling for revolutionary action but adopted an important resolution authorizing adherent organizations to propagate the federation's ideas and to "reserve methods of action in case its voice is not heeded." This was but a warning to the government that the veterans do not consider themselves bound by legal methods in all cases. The political program put forth by the congress advocates protection of the republican form of government, a strengthening of the executive authority and an organizing of the economic forces of the nation into a consultative chamber under the control of parliament. The latter is similar in design to the National Recovery Administration authority which prevails in the United States.

An executive committee of the Veterans' Federation discussed with Premier Doumergue a program which advocates the dissolution of the Chamber of Deputies, and a revision of the electoral laws instituting proportional representation and women's suffrage and new elections. The resolution adopted by the national congress to tolerate no cuts in pensions was disclosed to the Premier. M. Doumergue recently projected a cut in veterans' pensions. The French War Veterans, like other political groups in France, are taking a stand for complete reorganization of the state. Their movements in political circles are being watched minutely, lest, attracted by Fascist technique, they attempt to combine democratic principles with Fascistic ideals and turn to anti-republican movements.

Civil war still threatens the French Republic. At Cannes on March 27, a bomb destroyed the edifice of the Grand Orient Free Masons. Masonry has become an important, if not the principal, political issue in France today. All political parties throughout the Republic, whether Fascist or otherwise, unite in attacking Masonry. The Masons, on the other hand, are an important force in organizing resistance to Fascism which is believed to be steadily growing in France. The conflict between political groups and Masonry until the bombing at Cannes had been a battle of slander and accusation. The Stavisky affair has been referred to as a Masonic scandal due to the fact that several prominent Masons were deeply involved in the fraud. The February revolution has also been laid to Masonry. Many prominent members of both the Radical Socialist and the Socialist parties are Masons, as is Premier Doumergue himself but of the Scottish Rite. Those forces allied against Masonry have declared it to be "a sinister, secret state above the state, and politicians are supposed to obey blindly the instructions from the lodges on the pain of various sanctions, up to and including assassination." The agitation against Masonry in France is directed against the Grand Orient Masons who are not affiliated with the American and British Masons of the Scottish and York rites.

During the latter part of March alarming reports were circulated throughout Paris to the effect that radical factions of the Right and Left, desirous of forming a new government, were arming. An appeal was made to the government to prohibit the sale of arms to such groups. Police raids were conducted in and about Paris in which two arrests were made and a large stock of arms and ammunition seized. In 1831 a law was enacted in France which strictly regulated the sale of all arms to individuals. On March 29, 1934, the Government demanded that the one hundred and three year old law be strictly applied. War veterans, however, were not requested to surrender the arms in their possession. To date no riot has occurred in Paris which would substantiate the report that Right and Left factions were arming. According to M. Eugene Frot, Minister of Interior in the Daladier Cabinet, discontent is still seething and "unless the government disarms the Fascist, Royalist and Nationalist organizations it will render inevitable the arming of the Left and extreme Left forces." The principal societies in which plans for open revolt are brewing are the *Action Francaise, Jeunesse Patriote, Solidarite Francaise, Croix de Feu* and the Taxpayers Association. The total membership of these organizations is 1,195,000. The six societies have a riot strength of 6,200.

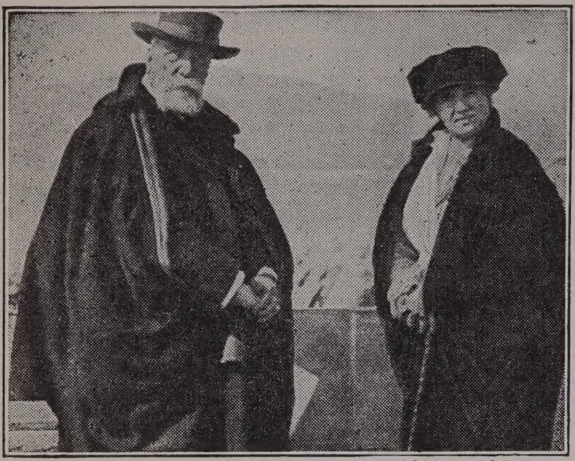
Royalist Claims. The claims of the French Royalist party, the *Action Francaise,* an anti-equalitarian group, have been heard above the din of civil war in France. The Royalists have not been revived in France for they never really passed out of existence. To-day, however, when national turbulence threatens the French State, the French Royalist party loudly declares that the French nation is in dire need of a king. The *Action Francaise* has a membership of 60,000. It was during the February revolution that Royalist claims were first uttered. The party considered it an opportune time to present the claims of John, Duke of Guise, to the French throne. The pretender to the throne, a great-grandson of Louis Phillippe, is now living in exile in Belgium. His son, the Count of Paris, is an aviator. Despite the vigor with which the Royalists are shouting their claims throughout France, there is little fear that their cries of "*Vive le Roi!*" will further the cause of royalism or win for the party new advocates. The success of the party thus far is due in large part to the genius of Charles Maurras and his identification of royalism with nationalism.

Foreign Affairs. France has also been pressed by foreign affairs. On March 20, the German Reich, in an effort to preserve peace, offered France a non-aggression pact somewhat similar to the treaty between Germany and Poland. France, however, stands firm in her refusal to agree on any rearmament for Germany unless she has guarantees of protection from the former allies, particularly Great Britain. The government of France has evinced great concern over the demands of Chancellor Hitler that Germany be permitted to rearm. As a result of this apprehension the French government announced a plan for reinforcing the army ranks. All unemployed young men in France who have left the service within the past five years have been invited to enlist for new short terms until labor conditions improve and employment increases. "The announced purpose of the government is to reinforce the army with short term recruits because the regular conscript classes are slacking off in numbers, due to the low wartime birth-rate."

On March 23, France presented an arms note to British officials in London which disclosed the desire of France to discuss the necessity of safeguarding against violations of any arms convention. The document also clearly asserts that Germany is violating the post-war Treaty of Versailles by rearming. France refuses to sanction such action on the part of Germany and at the same time join other powers in disarmament negotiations. France strongly upholds the League of Nations and asserts that any permission granted Germany to rearm would be a serious blow to the league, an organization to which "France remains faithful." The arms note despatched to Great Britain asserts that "Whatever may have been said or attempted against the league, it remains the only organization capable of furnishing a collective guarantee of peace." The request of the French government for Great Britain to join her in arms alliance is now under consideration by British diplomatic officials. France refuses to agree on any rearmament for Germany unless she is assured of protection from her former allies, especially Great Britain, an assurance which is unlikely if not impossible for Great Britain to offer at the present time.

France, Anatole, the pen name of Jacques Anatole Thibault, a distinguished French critic, novelist, and satirist. Alone in his room a great interpretative literary master of France would write a story, an essay, a poem, a novel or a popular history. Then he would rewrite it and rewrite it again. When the proof sheets would come back from the publisher his real task of revision would begin and often he would practically rewrite the whole story.

It was by such painstaking effort that Anatole France became an acknowledged peer in modern literature. His style was simple, graceful, and dignified. He admired short sentences. He was able to express French ideals better than any of his contemporaries.



Wide World Photos

ANATOLE FRANCE WITH HIS WIFE

Born at Paris, April 16, 1844, his first work to achieve general recognition was *The Crime of Sylvestre Bonnard*, published in 1881 when the author was 37 years of age. Among his best books are *Thais*, of popular historical interest, *Le Lys Rouge*, a novel, *Jocastre et le Chat Maigre, Sur la Pierre blanche, Las Sept Femmes de la Barbe Bleue, La Revolte des Anges*, and *La Rotisserie de la Reine Pedauque.* In his works he displays a polished style, brilliant wit, and idealism.

He was always an opponent of war, and disliked the petty nationalism which created geographic animosities. He gave voice to his conviction that the nations of Europe would some day become the United States of Europe. In 1920 he was married to Mlle. Emma La-Prevotte.

Francis I of France, was born at Cognac, France, on Sept. 12, 1494, and became king on Jan. 1, 1515. His first act was to reconquer Milan. Charles V, Henry VIII and the pope were in alliance against him, driving his troops out of Italy and invading France on the north. Taken prisoner at the battle of Pavia (1525), Francis was kept a year at Madrid, gaining his freedom only by renouncing Flanders, Artois, the duchy of Burgundy and all his Italian possessions. His struggles with Charles V continued until the peace of Crécy or Cressy, 1744. His reign is marked by the Renaissance (the new birth of learning), the beginning of the Protestant Reformation and the strengthening of the power of the monarchy. He fostered learning and art, invited painters and scholars to his kingdom, founded libraries, opened schools and built several of the finest palaces in France; but his persecution of the Vaudois has left a stain on his memory. He died March 31, 1547. See *Court and Reign of Francis I* by Pardoe and *Francis I and His Times* by Corgriet.

Francis II of Germany and I of Austria, was born at Florence, Italy, on Feb. 12, 1768, and succeeded his father, Leopold II, in 1792. His reign was a series of wars against Napoleon, in which, with the exception of the last, he was beaten. In 1806 he formally abdicated the crown of the Holy Roman Empire and made Austria an empire, himself becoming its first emperor. Although narrow-minded, Francis was a popular ruler. He died at Vienna on March 2, 1835.

Francis d' Assisi (*ȧs-sē′zė*), founder of the Franciscan order and a saint of the Roman Catholic church, was born in 1182. In his early years he was remarkable for his love of gayety; but sickness turned his thoughts from earth, and he at once commenced the practice of the strictest forms of religious discipline. He submitted to humiliations without number. By 1210 he had 11 followers, and he then drew up a set of rules for their guidance. The order was approved by Pope Innocent III in 1210, and in 1212 the Church of Santa Maria degli Angeli was assigned as their home. At the first general assembly, held in 1219, 5,000 members were present. From the sultan of Egypt Francis obtained for his order the guardianship of the Church of the Holy Sepulcher, which it still retains. Francis died at Assisi, on Oct. 4, 1226, and was canonized by Gregory IX in 1228. See Mrs. Oliphant's *Francis d' Assisi* and Sabatier's life of him.

Francis Joseph, emperor of Austria, born Aug. 18, 1830, and died Nov. 21, 1916, ascended the throne in 1848. He was crowned King of Hungary in 1867. His first task was to subdue the Hungarian revolt and pacify Lombardy (*q. v.*). But, in 1859, Lombardy was ceded to Italy. In the war with Prussia (*q. v.*) in 1866 Austria was defeated by Germany. Later an alliance was formed with Germany, and in 1882 with Italy. (See Dreibund). These alliances had important effects upon the course of the Great War. By the death of his only son, Rudolph, his nephew, Francis Ferdinand, who was assassinated in 1914, became heir. Ferdinand's brother Charles Francis Joseph (*q. v.*), succeeded Francis Joseph as emperor.

Francis Xavier. See XAVIER.

Francis'cans, also called **Minorites** or **Lesser Brethren,** a religious order of the Roman Catholic church, founded by Francis d'Assisi in 1210. The head of the order is called the general and lives in Rome. It is the parent of many religious institutions, the earliest being Observantists, known for their more strict observance of the rules; the Conventuals are the less rigid party. Another offshoot is the Capuchins, founded in the 16th century. There also are several orders of nuns in the Franciscan institute, the Little Clares, Capuchins and Urbanists being well-known. As a literary order they have been eminent in the theological sciences. The order supplied the papal throne with Nicholas IV, Alexander V, Sixtus IV, Sixtus V and Clement XIV. See Jessopp's *The Coming of the Friars.*

Franco=Prussian War (1870–71). The ostensible cause of this war, which proved so disastrous to France, was the offer, after the deposition and expulsion of Queen Isabella II, of the Spanish crown to Prince Hohenzollern, a relative of the king of Prussia. This France treated as an insult and peril to her. Though the prince declined the offer, France was, through the selfish ambition of the vain and shallow Napoleon III (q. v.) hurried into a war for which, as her prompt and humiliating defeat demonstrated, she was most poorly prepared.

From the very outset the war was disastrous to France, which was able to put, altogether, not more than 250,000 in the field against 450,000 Germans, with the most efficient equipment and very able generalship. The conflict began early in August with the crossing of the German frontier by a French division, 30,000 strong, which attacked the little town of Saarbrück, defended by a small force of Uhlans who were compelled to retire. At this affair there were present Napoleon and his son, the prince imperial, who, it was heralded by the emperor, here received his "baptism of fire." Two days later occurred the affair at Weissenburg, where the German crown-prince (afterward Emperor Frederick) fell upon the right wing of the French army under MacMahon, and on Aug. 6 attacked and routed the French at Wörth. On the same day the Germans, under Steinmetz, gained another decisive victory at Spicheren, which was followed shortly afterward by a further success at Courcelles, over Marshal Bazaine, who was driven into Metz and there besieged by a German division under Prince Frederick Charles. Just before the investment of this, the capital of Lorraine, occurred the battle of Vionville and the murderous one at Gravelotte (Aug. 14–18), seven miles west of Metz, where some 35,000 men of both sides were placed *hors de combat.* These crushing disasters to soldiers with whom Napoleon I had terrorized all Europe were due to the selfishness and incompetence of Napoleon III and his officers and the absence of any fixed plan of campaign.

The Germans, by the strategy of Field-marshal Von Moltke, lost no time in following their successes by others equally demonstrative of their preparation for the war. At the end of August the French were once more defeated, this time in the battle of Beaumont, which compelled MacMahon to abandon the attempted relief of Bazaine at Metz, to fall back with the French emperor, and to shut himself and his army of 80,000 within Sedan, only to capitulate on the first day of September. When news of the surrender and the capture of the French emperor reached Paris, the tumult in the capital led Empress Eugènie to take flight, when the third republic was proclaimed and the empire collapsed. This was followed (Sept. 19) by the investment and siege of Paris by the Germans and, a week later, by the surrender of Strassburg and 18,000 French, and a month afterward by the surrender of Metz (Oct. 27), its fortress and 173,000 men. Various other victories fell to the Germans during the remainder of the year, and Paris capitulated, after a number of bloody sorties, Jan. 28, 1871. The end came with French overtures for peace, adopted at Versailles (Feb. 26), which were ratified, May 10, 1871, by a definitive treaty between the two nations at Frankfort-on-the-Main.

Franco'nia Mountains. See WHITE MOUNTAINS.

Frank'fort, the capital of Kentucky, is situated on the Kentucky River, 29 miles northwest of Lexington. It is noted for its beautiful scenery, has well-paved streets and several parks. Frankfort has an admirable public-school system, and other educational institutions are a young ladies' seminary and a military school. It contains the state-house, the state-library, the penitentiary and a beautiful cemetery. It has a large lumber-trade, and manufactures lumber-products, twine, pottery etc. Frankfort has the service of three railroads and a population of10,465.

Frankfort=on=the=Main, a city of Prussia, once a free city, is situated on the right bank of the Main, 22 miles from its junction with the Rhine at Mainz. There are seven bridges across the Main at Frankfort, one of them built in 1342. The city has been extended and improved, the fortifications being replaced by ornamental promenades and the river bordered by broad quays. One of the squares is adorned with a statue of Goethe, its most celebrated citizen, and the Gutenberg monument commemorates the invention of printing. The exchange, opera-house, museums, art-galleries, public library, two conservatories of music and the central station, one of the largest and handsomest railroad-stations in Europe, are among the modern buildings. Frankfort is a wealthy city, having always had a large trade in iron and steel-goods, leather, skins, coal, wine and beer, sewing machines, soap and perfumery. Its chief importance, however, is due to its being one of the money-markets in the world. It was the home of the Rothschilds, and their ancestral house is now the sole relic of the famous Jew-street of Frankfort. It is said to owe its name to Charlemagne, who here led his Franks across a ford of the river Main; and from 843 to 889 it was the capital of his kingdom. It was the first free city of the German empire, and the most important. It was long famous as the place of the election of the German emperors, and the town-house contains the imperial hall where each newly elected emperor held a public banquet. The coronation took place in the Cathedral of St. Bartholomew, which also contains the chapel in which the electors voted. The North German *Diet* met at Frankfort from 1816 to 1866. Frankfort became Protestant in 1530. It lost its independence in the Confederation of the Rhine; became free again in 1816, but in 1866 was taken by Prussia. The peace of Frankfort, which ended the Franco-German War, was signed here in May, 1871. According to the latest census report (1925) the population is 540,115.

Frankincense (*frănk'in-sĕns*), a name used to designate fragrant, resinous substances, which give off a strong odor in burning and are used in religious services. That of the Jews and ancient Greeks and Romans is known as *olibanum.* The natural gum of several kinds of trees, such as the fir, is the common frankincense.

Franklin, a term frequently found in English literature. It means a freeholder or substantial householder of the middle class. The word comes from the late Latin word *Francus,* meaning free. The most striking use of this term in English literature is by Geoffrey Chaucer, who described the franklin as one of the characters in his "Canterbury Tales."

The franklin of later days, as portrayed in *Winter's Tale,* evidently fell from his high estate and corresponded to the well-to-do yeoman of the day.

Franklin, a town in Williamson County, Tennessee, is situated eighteen miles south of Nashville on the Louisville and Nashville Railroad. Among its beautiful buildings is an imposing Masonic Temple. Franklin has an excellent school system. Here are located Tennessee Female College, established in 1856, and Harpeth Male Academy. The principal industries include planing and flour-mills, carriage-factories, and several steam cotton-gins. An important battle was fought at Franklin on November 30, 1864, between the Union forces under General J. M. Schofield and the Confederate troops under General J. B. Hood. After a hard-fought battle, General Hood was repulsed with a loss of 6,000 men, while the Union army lost 2,300 men. The population in 1930 was 3,377.

Franklin, Benjamin. There is something perennial about the spirit of this great American patriot of civil life, philosopher, statesman, diplomat and writer. Although born in the infancy of science (on January 17, 1706), and dying (on April 17, 1790) in the infancy of the republic he had helped establish, he projects himself into the interests and problems of today and of all times as does no other man who figures in American history. His many-sided genius, sublimated common-sense, practical citizenship, hospitality to new ideas and ideals and his moral courage make him a character to whom men of any age must have turned with confidence and hope. There is nothing in Franklin's ancestry or environment to account for him. In the family-history for four centuries behind him there had not been one man who rose above mediocrity, or one who fell below respectability. The Franklins were small landed-proprietors or tradesmen in Northamptonshire, England; simple, industrious, pious. The father emigrated to Boston in 1682, and set up in business as a candle-molder and soap-boiler. His tenth child was taken to the Old South Church, christened Benjamin, and dedicated to the ministry. Lack of money for the necessary education forced the boy to learn the printer's trade.

Benjamin Franklin

Disputatious, sarcastic, vain, resenting control and given to expressing unpopular opinions, the boy got into disrepute in the strict Puritan town. So, at the age of seventeen, he ran away to Philadelphia. He landed with a silver dollar, a trade, plenty of self-confidence and a suddenly-formed resolution to turn over a new leaf, thus showing remarkable strength of character. Ever afterward he was noted for his suavity, avoidance of controversy and patience.

At the age of twenty-three he owned his own printing-office and was publishing the *Pennsylvania Gazette,* which, it is claimed, survives today in *The Saturday Evening Post.* For the next twenty years he was the foremost journalist in the colonies. *Poor Richard's Almanac,* issued annually for a quarter of a century, made him known from city mansion to the remotest frontier-cabin. While making fame and fortune as a printer, publisher and writer, he was studying foreign languages and literatures, experimenting in science and taking a conspicuous part in local affairs. From 1736, when he was chosen clerk of the Pennsylvania General Assembly, until 1786, when he returned from Paris at the close of the American Revolution, he was almost continually in the public service, and this without compensation. Big and little things alike claimed attention. Now he was organizing a police or fire-department or local militia; now putting a street-lamp before his gate and paving his sidewalk to arouse public spirit; building an Academy of Science; a church free for all denominations; collecting books for the first free circulating library; organizing a system of colonial defense against the Indian; inventing rockers for his easy-chair and a portable fireplace, called the Franklin stove, and refusing to take out patents. He always declared that as we are indebted to the ingenuity of men in the past, so it is only a duty to give our own contrivances to the present and future.

After 1760 (his 54th year) Franklin spent a quarter of a century abroad in the service of his country. His discovery of the identity of lightning and electricity had long before made him the best-known American in Europe. Learned societies and universities welcomed him, and he soon won equal distinction as a diplomat. Ten years he spent in London. He got the stamp-act repealed. An eminent English statesman declares to-day that had the king and Parliament accepted Franklin's just contention that the American colonies were self-governing, owing allegiance only to the sovereign, the Revolutionary War might never have been fought. Franklin, after a decade of working in vain for peace with honor and justice. returned to help frame the Declaration of Independence, to place $20,000 of his fortune at the service of Congress, and then cross the sea to win the help of France in the cause of American liberty. His position in Paris, although he represented poor, rebel colonies whose success seemed unlikely, was extraordinarily influential, unprecedented and never again equalled in the history of diplomacy. Camp and court and the world of science were at his feet. Never before had Europe seen a man at once so wise and witty, so urbane and with such upsetting ideas of the equality of men and of the duties of rulers. His simple dress became the fashion; his benign face adorned ornaments of cameo; his portrait was in college, palace and cottage. He was the first great plebeian standing upright before kings, and he fired the imagination of the people. This is believed to have had its influence in hastening the French Revolution.

It is flattering to our pride to learn that the mind, character and versatile genius of Franklin have been called an epitome of all that is best in the typical American. He won as the best among us win,—by straightforwardness. He introduced "shirt-sleeve" diplomacy into Europe; he had shrewdness, good nature, open-mindedness, persistence and infinite knowledge of the world and of human nature.

When Franklin returned to America, he was in his 86th year and begged for rest; but he became chairman of the municipal council, a member of the constitutional convention that drafted the constitution; and he organized the postal service, travelling in a carriage through every state. Conquered at last by the infirmities of age, he continued to give scientific discoveries to the world. His last public act was to affix his signature to a memorial to the state legislature, as president of the Pennsylvania Abolition Society. Abolition in 1790 brings Franklin into touch with Lincoln three quarters of a century later. He seems equally in touch with wireless telegraphy, aerial navigation, the currency and other questions of to-day. No life of him is comparable to his own autobiography. As literature it is a classic, and as a human document it is unsurpassed in its illuminating candor.

Franklin, Admiral Sir John. To the man who perishes in a brave cause the world pays peculiar honor, and when his death is obscure and lonely and his grave unmarked, it adds tender regret. This heroic Arctic explorer is one of the few whose memory is so enshrined in the hearts of men. To hear his story is to be, not saddened by his fate, but uplifted because such a man, and one of our own Saxon blood, has lived and shown how a devoted man may die.

It is not improbable that the British admiral sprang from the same north-of-England stock as our own Benjamin Franklin. He was born on April 16, 1786, in Lincolnshire, a county that adjoins Northamptonshire, whence Benjamin Franklin's father had emigrated a hundred years before. The name is old Saxon for free-holder, and the ancestors of both were small landed-proprietors or tradesmen—thrifty, industrious, pious, unremarkable. At 14 John Franklin was on the quarter-deck of a naval vessel; at 15 in the battle of Copenhagen where Nelson won his first laurels. Two months later the boy sailed with an expedition to explore and map the coast of Australia, then almost unknown. Here he acquired skill in surveying, deep-sea sounding and astronomical observation that fitted him for his work as a scientific explorer. Adventure marked the gallant boy for its own. He was wrecked on a coral island; he was signal officer on the *Bellerophon* at Trafalgar; he commanded a vessel at the battle of New Orleans; at 32 he was a minor officer in a polar expedition. At 41, with the rank of captain, he commanded an expedition to map Mackenzie River. Honors crowded thick and fast upon him—a knighthood and then, for seven years, the governorship of Tasmania. In May, 1845, as an admiral, he sailed again, with the *Erebus* and *Terror*, to discover the northwest passage. Calmness in time of danger, resourcefulness, the highest order of seamanship, a sanguine temperament, the capacity for inspiring trust and loyalty in the men of his command and scientific ardor had long marked Sir John as the one man in England most likely to succeed in so hazardous an undertaking where so many had failed.

He discovered the northwest passage, but at so terrible a cost that the 20th century was six years old before anyone ventured to force a way through it. (See AMUNDSEN, ROALD).

The *Erebus* and *Terror* were last hailed by whalers in Baffin's Bay in July of 1845. Franklin died on King William's Island, Boothia, at the eastern end of the passage that had been sought since the days of Sebastian Cabot, in June of 1847. The survivors all perished in the attempt to reach the main land. Details of the disaster were recovered piecemeal, along with relics from the abandoned ships, from Esquimaux and from a packet of buried papers. Fifteen expeditions were fitted out first to relieve, then to find trace of, the lost explorers. Two of these were led by Dr. Elisha Kent Kane, the American scientist. It was not until 1857 that the yacht *Fox*, sent out by Lady Franklin, brought back the story of Franklin's tragic end. His resting place in that vast tomb of ice has never been located, for the ships vanished. Lady Franklin spent her entire fortune and 15 years in efforts to recover his body. The monument raised in Westminster Abbey pays tribute to her as well as to her hero. For the cenotaph Tennyson, the laureate, wrote these words:

"Not here! The white north holds thy bones; and thou,
Heroic sailor-soul,
Art sailing on another voyage now,
Toward no earthly pole."

See *Life* by Beesly.

Franklin, William Buel, American general, was born at York, Pa., on Feb. 27, 1823, and graduated at West Point in 1843. Early in his career he served in the War with Mexico, and on the outbreak of the Civil War he was appointed colonel of the 12th infantry, subsequently rising to the rank of major-general. He commanded the sixth corps through the peninsular campaign, fought at South Mountain and Antietam, and was in command of the left grand division of the United States army at Fredericksburg at the close of 1862. In 1864 he was given command of the 19th army corps, which took part in the Red River expedition, but was wounded and obliged to retire from active service. After the war he became vice-president of the Colt Firearms Company at Hartford, Conn. In 1880 he was president of the board of managers of the National Soldiers' Home, and in 1889 was United States commissioner to the Paris exposition of that year, which won him the insignia of grand officer of the Legion of Honor from the French government. He died on March 8, 1903.

GEN. WILLIAM B. FRANKLIN

Franks, a name applied in the 3d century to a number of German tribes living on the middle and the lower Rhine. They were a stalwart race of warriors, distinguished by long hair, blue eyes and largeness of limb. They lived in villages, and had gardens and vineyards. To the Salian Franks is due the celebrated Salic law.

Franz, Robert (1815–1892), was one of the most important of German song-writers, ranking with Schubert and Schumann in consummate artistry. Besides 257 songs for single voice, he composed sacred and secular choral works and made masterly arrangements of Bach, Handel and other great composers.

Fra'ser, Hon. Duncan C., was born in Nova Scotia, and graduated from Dalhousie University. He held important public positions in his own province; was first elected to the Canadian House of Commons in 1891; and was appointed a judge of the supreme court of Nova Scotia in 1904. He was appointed lieutenant-governor of Nova Scotia in 1906. An able platform-speaker, he is an ardent free-trader.

Fraser, William A., was born in Nova Scotia in 1859. By profession at first a mining engineer, he became a frequent contributor to magazines, devoting himself especially to animal stories. Among his books are *The Outcast, Thirteen Men, Thoroughbreds, Mooswa* and *The Lone Furrow.*

Fraser (*frā'ser*) **River,** the principal stream of British Columbia, is formed by two branches, the more important of which rises in the Rocky Mountains. The river is 800 miles long, and flows into the Georgian Gulf. Salmon-fishing is one of the great industries along its banks. Steamboats can navigate it for 100 miles, when the river passes by a series of swirling rapids through the Cascade Range, the grand cañon of the Fraser.

Fraunhofer (*froun'hō-fĕr*), **Joseph,** a German optician and physicist, was born near Munich on March 6, 1787, and died there on June 7, 1826. His early training was that of a glass-polisher, being apprenticed at the age of twelve. His chief accomplishments, perhaps, are the invention of the diffraction-grating (See DIFFRACTION-GRATING); the discovery of the dark absorption lines in the solar spectrum, now known as Fraunhofer's lines; the discovery that the stars have spectra of the same general type as the sun but different from that of the sun; and a general discussion of the phenomena of diffraction.

His most important papers have been edited and reprinted by Professor Ames in Harper's *Scientific Memoirs.*

Frechette (*frā'shĕt'*), **Louis, LL. D.**, president of the Royal Society of Canada and member of numerous literary and learned societies, was born at Levis, Quebec, on Nov. 16, 1839. He was educated at Laval University and Nicolet College, was called to the bar in 1864, afterward removing to Chicago and living there until the great fire of 1871. He divided his attention between law and editing *Le Journal* of Quebec and *La Patrie* of Montreal, representing Levis in Parliament in 1874, until in 1889 he became clerk of the legislative council of the province of Quebec. His publications are numerous and met with appreciation. In addition he made translations in French of the works of Howells and Cable and of several dramas and comedies. He died on May 31, 1908.

Fred'erick I, called Barbarossa or Red-Beard, was born about 1123, and became emperor of Germany in 1152. His reign was a long struggle with powerful vassals at home and with Lombardy and the pope in Italy. He captured Milan in 1162, and took Rome by storm five years later. His army was, however, smitten with the plague, and Lombardy again revolted; and in 1176 he was defeated at Legnano. At home he managed his vassals by conciliation and by keeping the balance of power among them equal. He asserted his power, moreover, over Poland, Hungary, Denmark and Burgundy. At the height of his fame and influence he took the cross to fight against Saladin. He defeated the Mohammedans in two battles, but was himself drowned in Pisidia on June 10, 1190. The legends and songs of Germany still cling about the memory of Frederick Barbarossa.

Frederick III, second German emperor and eighth king of Prussia, was born at Potsdam, Oct. 18, 1831, and was in early life educated to the profession of arms. After leaving Bonn University he studied the art of war under Moltke. In January, 1858, he married the princess-royal of England. He took a prominent part in the War with Austria and in the Franco-Prussian War; for his services in the latter campaign he was made a field-marshal. In 1887 he showed signs of suffering from a throat trouble, and was operated upon in February, 1888, without success. On the 9th of March Emperor William I died, and Frederick ascended the throne as Frederick III. His throat continued to trouble him, and, despite all that medical science could do for him, he died on June 15, 1888.

FREDERICK III

Frederick I, king of Prussia and third elector of Brandenburg of that name, was born at Königsberg, July 11, 1657. He succeeded to the electorate in 1688, and on Jan. 18, 1701, elevated himself to the dignity of a king. He gave valuable support to William of Orange in his attempt on England, and characterized his reign by advancing the arts and sciences. Frederick died on Feb. 25, 1713, and was succeeded by his son, Frederick William I.

Frederick II of Prussia, better known as Frederick the Great was born at Berlin, Jan. 24, 1712. His early education was directed by military men, and its narrowness forced him into frequent open rebellion. When but eighteen he attempted to escape to England, but was unsuccessful; his father looked upon this act as military insubordination and political rebellion, and punished him with close confinement at Küstrin, where he remained until 1733, when, shortly after his liberation, he married Princess Elizabeth Christina of Brunswick. Until 1740 he devoted his leisure time to the study of music and French literature, and then began to manifest signs of political ambition. On May 31 of that year he became king, and in the following December entered into a war with Austria, putting forward as a reason an old claim upon the province of Silesia. He twice defeated the Austrians, and by the treaty of Breslau, June, 1742, was awarded Upper and Lower Silesia. He again added to his territories as the result of a second Silesian War (August, 1744, to December, 1745), and after eleven years of peace he began a Silesian campaign (1756), better known as the Seven Years' War. In 1772 he added Polish Prussia and a large part of Great Poland to the Prussian crown. He died at Potsdam, Aug. 17, 1786. His military achievements gave him fame as a great military leader, whence his title of Frederick the Great. He was very popular among his people with whom he was extremely democratic. See Carlyle's *History of Frederick II.*

Frederick Charles, a Prussian prince known as the Red Prince from the color of his favorite hussar-uniform, was born at Berlin, March 20, 1828. He was educated for the army, and saw service in the Schleswig-Holstein War and in the second Danish War; while in the Austrian War he won the great victory of Königgratz. In the Franco-Prussian War he commanded the second army, drove Bazaine back to Metz, and compelled that fortress to surrender on Oct. 27, 1870. He was one of the ablest of Prussian generals. He died June 15, 1885.

Frederick William, elector of Brandenburg, commonly called the Great Elector, was born on Feb. 16, 1620, succeeded to the electorate in 1640, and died on April 29, 1688. On his accession, he found an empty treasury and general devastation on account of the Thirty Years' War. He instituted a policy of peace, and devoted himself to consolidating his dominions; and when he died, he left a well-filled treasury and a highly-organized army. He was succeeded by his son, Frederick III, afterward King Frederick I of Prussia.

Frederick William I, king of Prussia, was born at Berlin, Aug. 15, 1688. The greater part of his reign (1713–40) was devoted to the improving of Prussia's internal condition, and the result of his policy was seen at his death, which occurred on May 31, 1740, when he left to his son a treasure of $6,750,000 and an army of 80,000 men, at that time the best-drilled force in Europe.

Frederick William IV, king of Prussia, was born Oct. 15, 1795. His reign (1840–61) was one long struggle of the people of Prussia against their king for a constitutional form of government. At length, on Jan. 31, 1850, the country was granted a representative parliament. He died on Jan. 2, 1861, being succeeded by his brother, Emperor William I of Germany.

Frederick, Md., a city and county-seat of Frederick County, 62 miles from Baltimore. It is the scene of Whittier's poem *Barbara Frietchie*, and its importance is chiefly historical. Twice during the Civil War it was occupied by the Confederates. The second time, in 1864, General Early demanded a large ransom, which was paid. General McClellan with Federal troops occupied the city in 1862. Frederick has manufactories of leather, brushes, knit-goods, shirt-waists, tobacco, etc., besides canning-factories, iron foundries, flour and planing-mills. Here are located the State School for Deaf and Dumb, Frederick College, Hood College and Hood Seminary. It is served by the Pennsylvania and Baltimore and Ohio railways. Population, 13,000.

Fred'ericksburg, Battle of, was one of the great battles of the American Civil War, in which the Union forces sustained a defeat. General Burnside divided his command into three divisions, and advanced to Falmouth opposite Fredericksburg, Va. Before the head of his column had crossed the Rappahannock, Lee had fortified the heights in rear of the town, and so harassed the Union forces that it took two days to cross. On Dec. 13, 1862, Burnside moved to the attack, but was forced to retire. Next day he wished to renew the attack, but was persuaded not to do so, and on the night of the 15th, under cover of a storm, what remained of the Union army was brought back to Falmouth. Burnside lost 12,321 men, while the Confederate loss was 5,309 men. Burnside, a week later, was relieved of his command, and General Hooker was appointed to succeed him.

Fred'ericton is the capital of New Brunswick, and is situated on the right bank of St. John River, 85 miles from its mouth, at the head of navigation. Population 7,500. Its chief business is lumbering. The normal school, the Canadian School of Infantry and the Parliament-buildings of the province are located here.

Free'man, Edward Augustus, one of the most learned of English historians, was born in 1823, at Harborne, Staffordshire; and died in Spain on March 16, 1892. He studied at Trinity College, Oxford, and in 1845 became a fellow of that college. He was a master of research, as is seen in his works, some of the best known being *A History of the Saracens; History of the Norman Conquest;* and *The Ottoman Power in Europe*. During 1881-82 he traveled in the United States, and on his return to England published *Some Impressions of the United States*. With his appointment as regius professor of modern history at Oxford, Freeman's industry was greatly whetted, and he became a voluminous writer. Besides his historical works, he wrote largely on antiquarian and topographical subjects as well as on architecture, and on comparative politics. He also published useful textbooks of historical nature, as *Old English History; General Sketch of European History; Historical Essays; History of Sicily; Methods of Historical Study; Historical Geography of Europe William the Conqueror*, and *Sicily: Phœnician, Greek and Roman.*

Freeman, Mary Eleanor Wilkins, American authoress, was born at Randolph, Mass., in 1862, and in 1902 married Charles Freeman. She has written largely on New England life. Her chief works, besides poems, short stories etc., contributed to magazines, embrace *Jane Field; A New England Nun; Giles Corey, Yeoman; Young Lucretia; The Wind in the Rosebush; The Givers*, and *By the Light of her Soul.*

Free′masons are members of a secret society, the origin of which has by tradition been variously traced back to the Knights Templars, the old Roman empire, the Pharaohs, Hiram of Tyre, the Temple of Solomon or even to the times of the Tower of Babel and of the Ark of Noah. In reality the craft sprang into being from the same causes and reasons as other incorporated crafts. Their vocation as hewers and setters of stone compelled masons to travel from place to place in search of work. In order that they might be accepted as skilled workmen by their brother craftsmen, without the necessity of showing their skill, they made use of signs and words which they kept secret. Scotland possesses the earliest record of the presence of masons in lodges, tracing their origin to the foreign masons who came to Scotland in the 12th century to build the abbeys of Holyrood, Kilwinning and Melrose. The masons of England date back to 926, when King Athelstan held a meeting of masons at York. Modern freemasonry was introduced into America in 1730, into France in 1725, Russia in 1731 and Germany in 1740. There are over 48 grand lodges, exercising control over nearly 10,000 lodges in the United States, and nowhere is masonry held in greater honor or importance. The total membership in the lodges of the United States and British America for 1907 was 1,188,566. A set of passwords and a peculiar grip of the hand enable the initiated to recognize each other A great benefit derived from membership in the order is that it enables a mason where he is a stranger to make himself known to his brother-masons and claim their protection. See J. Fellowes' *Mysteries of Freemasonry.*

Freeport, Ill., county-seat of Stephenson County, is situated on the Pecatonica River. It is 113 miles west of Chicago, on the main line of the Illinois Central and three other roads, besides having several interurban lines. There are automobile, buggy, gas-engine, and novelty manufactures, and also the largest windmill factory in the world. Freeport has a large number of churches, nine public schools employing 95 teachers and enrolling 3,100 pupils and a Y. M. C. A. building costing $150,000. There are two daily, three weekly papers and six banks. Population, 20,000.

Free Trade is the name applied to a certain policy of a government in regard to foreign trade. Its main feature is that no duties are placed on imported foreign products. The opposite theory is protection, and its supporters believe that a nation grows and gains wealth faster by taxing imports and so "protecting" its own manufactures and other products. England has for years been the leading free-trade country, having become such under the leadership of Richard Cobden; while a Scotchman, Adam Smith, the apostle of free trade, has done more than any other to promote the belief in free trade by his famous book, *The Wealth of Nations.* The United States, France and Germany are the foremost protection countries, and France is the most highly protected nation in the world. At the present time the idea of protection seems to be gaining ground throughout the world, though in the United States there have not only always been many free traders, but there are more who believe in it now than ever before. See PROTECTION. See, also, Adam Smith's *Wealth of Nations;* Fawcett's *Free Trade and Protection;* John Morley's *Life of Cobden;* and Carey's *Principles of Social Science.*

Freischütz, Der. Opera in three acts; words by Kind; music by Weber. First produced at Berlin, June 18, 1821. Notable as the most complete early embodiment of the ideals of the romantic school of opera. It deals with the supernatural in connection with a simple love-story. The overture — a great favorite in the concert-room — introduces the principal themes of the opera, and ranks among the finest examples of the so-called program overture.

Frémont′, John Charles, an American explorer and general, was born at Savannah, Ga., Jan. 21, 1813. In 1835 he was professor of mathematics in the navy, but soon became a civil engineer and was employed in surveys by the United States government. He explored the Rocky Mountains, and proved the possibility of an overland route to the western coast of America. The highest peak of the Wind River Mountains, 13,570 feet high which he ascended, is named after him as Frémont's Peak. He crossed the South Pass, explored Great Salt Lake and went as far as Fort Vancouver, at the mouth of the Columbia. He forced a passage in the winter over the snow-covered mountains into California, reaching Sacramento in March with his men reduced to skeletons. In the spring of 1845 he set out again to explore the country between the Mississippi and the Pacific. This journey probably gave California to the Union, as he found the Mexican troops marching against the settlers

JOHN C. FRÉMONT

to drive them out, and he joined with the settlers against them and defeated them. The Americans declared themselves independent, and made Frémont governor. He was sent to Congress as senator from California in 1850. He was the Republican candidate for the presidency in 1856. In the Civil War he served for two years as a major-general. He also was governor of Arizona from 1878 to 1881. He died at New York, July 13, 1890. His services as an explorer were rewarded by a gold medal from the king of Prussia, with the founder's medal of the Royal Geographical Society of London and with membership in the Geographical Society of Berlin. See *Life* by Mrs. J. C. Frémont, the brilliant daughter of the famous Senator Benton of Missouri.

Fremont, Ohio, city, county-seat of Sandusky County on Sandusky River, 30 miles east of Toledo. It is in the center of an agricultural, oil and natural-gas region. Agricultural implements, cutlery, machinery, electro-carbons, woolens, beet-sugar, doors, sashes etc., are manufactured here. The city has good public schools, business colleges, a normal school and Birchard Public Library, founded by an uncle of President Hayes. Fremont has all the equipment of a progressive city, is served by three railroads, and has steamer-connection with all important ports on Lake Erie, with which it conducts much business. The city occupies the site of a tradingpost established in 1785, and was given its present name in 1850 in honor of J. C. Frémont. Population 15,000.

French, Alice, American authoress, known also by her pen-name, Octave Thanet, was born at Andover, Mass., March 19, 1850, and educated at Abbott Academy there. She began to write about 1878, her earliest productions being short stories illustrating western and southern life, with which she is familiar. Her chief books are *Knitters in the Sun; Stories of a Western Town; The Heart of Toil;* etc.

French and Indian Wars, 1689–1763. Under this term are included the four intercolonial wars of the 17th and 18th centuries in America, known as King William's War, Queen Anne's War, King George's War and the specifically-entitled French and Indian War — all of them conflicts with the French and Indians of Canada (New France). The last of the series, however (which is coincident with the Seven Years' War in Europe), is especially characterized in the American colonies by the designation of the French and Indian War, which comprised the period between 1755 and 1763.

This grand struggle was inevitable from the conflicting character of the respective governments England had settled the eastern coast, and claimed the territory from the Atlantic to the Pacific. The French had occupied the valley of the St. Lawrence, and, exploring westward along the Great Lakes, had followed the Wabash and Illinois Rivers to the Mississippi and thence down the great valley to the Gulf. These explorations were carried on chiefly by the Jesuit missionaries, who with unflagging energy and at the greatest personal risk, pushed far into the wilderness to establish missions among the Indians. In 1673 Father Marquette, a missionary, and Joliet, a trader, together passed down the Wisconsin River to the Mississippi and thence down that river to the Arkansas. La Salle, the most indefatigable of these explorers, received from the French king a tract of land adjoining Fort Frontenac, in recognition of his services in exploring Lakes Erie and Ontario. He then pushed westward through the Great Lakes, explored the Illinois and descended the Mississippi to the Gulf. On the line of these explorations the French had, in 1750, established 60 small military and trading-posts, stretching along the lakes and down the Maumee, the Wabash, the Illinois and the Mississippi to New Orleans. They had also traversed the country to the headwaters of the Ohio. They had thus taken formal possession of this vast country, while but little had been done in the way of colonization.

Thus far no conflict had occurred, because the English had not yet pushed their way west of the Alleghanies upon disputed territory. But in 1749 a corporation called The Ohio Company received from the king a grant of land west of the Alleghanies, along the Ohio, and opened traffic with the Indians. The French promptly resented the infringement upon their claims. The governor of Canada sent 300 men into the valley, who drove off the traders. In 1753 the French built three forts at Presque Island on Lake Erie, Fort Bœuf a short distance south and Fort Venango on the Alleghany River. Governor Dinwiddie of Virginia sent George Washington, then 21, with a message to the French General St. Pierre, in command of these forts, setting forth the claim of Virginia to the territory west of the Alleghanies and remonstrating against its occupancy by the French. Washington was courteously received, but the French commander positively declined to consider the claims of Dinwiddie. In 1754 the Ohio company built a blockhouse on the present site of Pittsburg. This was soon captured by the French, who proceeded to build Fort Duquesne on the same site. Meantime a force of 600 Virginians under Colonel Fry, Washington being second in command, were on their way to the same point. While *en rout* Colonel Fry died, leaving Washington in command. At Great Meadows, within 50 miles of Fort Duquesne, learning that a French force was marching against him, he built a stockade which he named Fort Necessity. Here, on the third of July, he was attacked by the French General De Villiers with a force of 1,500 French and Indians, and after a stubborn defense was compelled to surrender.

Meantime the English government made active preparation for war. In February, 1755, General Braddock arrived with two regiments of troops. To these were added a small body of militia, and with this force he marched in April through the wilderness against Fort Duquesne. On the 9th of July Braddock was met and defeated by a large force of French and Indians, himself falling mortally wounded. A second expedition under Governor Shirley, which was sent from Albany against Fort Niagara, returned without attempting to capture it. Governor Johnson of New York, in command of a militia force, marched against Crown Point. He built Fort Edward on the Hudson, and, proceeding, met and defeated a force of French and Indians under General Dieskau, who was killed. Johnson went no further, but here built a fort which he named Fort William Henry. A fourth expedition was sent by Governor Lawrence of Massachusetts to attack the French forts on the Bay of Fundy. These they captured with little resistance, and the whole country of Nova Scotia or Acadia fell into their hands. The English were here guilty of a great piece of cruelty. The country was laid waste and the inhabitants, simple French peasants who had taken no part in the war, were driven into exile at the point of the bayonet.

The events narrated cover the operations of 1755. The plan of operations for 1756 covered the same points, viz., the capture of Forts Duquesne, Niagara and Crown Point. Not one of these objects was accomplished. On the other hand the French, led by Marquis de Montcalm, a successor of Dieskau, captured Oswego. A fleet of vessels, 135 cannon and 1,500 prisoners fell into his hands. During the summer the settlements in western Pennsylvania and Virginia were ravaged by Indians, who killed and captured large numbers of settlers. They were finally defeated with great loss in a battle near the Indian town of Kittanning. In 1757 but one expedition was undertaken by the English. Lord Loudon, who had been appointed commander-in-chief of the British forces, sailed against the fortress of Louisbourg with an army of 6,000 regulars. A fleet under Admiral Holbourn, with 5,000 men, joined him at Halifax. Learning that the garrison at Louisbourg had been reinforced, Loudon sailed back to New York without firing a gun. Meanwhile Montcalm appeared before Fort William Henry with a force of 5,000 French and Indians. After a brave defense of six days the garrison under Colonel Monroe was compelled to surrender. Montcalm destroyed the fort and returned to Crown Point.

At the close of this year — the third since hostilities began — the advantage rested decidedly with the French. The English had accomplished little, and had been driven back at the points of chief importance. With the opening of 1758 the government of England made preparations for a vigorous campaign. Twenty-two thousand troops were sent from England; the colonies furnished 28,000 militia. General Abercrombie was appointed to succeed Lord Loudon as commander-in-chief, with an able corps of subordinates, including young Lord Howe, General Amherst and General James Wolfe. Expeditions were planned against Louisbourg, Ticonderoga and Duquesne. General Amherst with a force of 10,000 men captured Louisbourg on July 28, with nearly 6,000 prisoners. Cape Breton and Prince Edward Island passed under English control. The attack on Ticonderoga was conducted by General Abercrombie at the head of 15,000 men. The English were repulsed after four hours' hard fighting, with a loss of 2,000 in killed and wounded. The English fell back to Fort George. Colonel Bradstreet was sent with 3,000 men against Fort Frontenac (Kingston) on Lake Ontario. He captured the place after a siege of two days. This success proved to have an important bearing on the capture of Fort Duquesne, which was abandoned by the French and was occupied by Virginian troops under Washington on Nov 25.

The year 1759 opened with the advantage greatly on the side of the English. Their combined forces numbered nearly 50,000 men against 7,000 on the side of the French. Three expeditions were planned, one against Niagara, a second against Ticonderoga and Crown Point and a third against Quebec. Niagara was captured by Sir William Johnson, who took the place, after severe fighting, on July 25. In the same month General Amherst, with 11,000 men, marched against Ticonderoga. On his approach the place was abandoned by the garrison, who retired to Crown Point. This place also was abandoned five days later, and was occupied by the English. Thus these important positions fell without a struggle. Wolfe commanded the expedition against Quebec, where, on Sept. 13, occurred the most desperate and the decisive battle of the war, resulting in the defeat of the French. Wolfe was killed and Montcalm, the French commander was mortally wounded at the city's gate. Four days later the city and fortress were surrendered to the English. In September, 1760, Montreal surrendered. This was the last point of importance held by the French, and with it Canada passed into the possession of Great Britain.

The war between England and France ended with the treaty of Paris of 1763. France surrendered all her possessions east of the Mississippi, except the Island of Orleans. At the same time Florida was ceded to England by Spain. The possessions of England in America were now 20 times greater than when the war began. The Indian tribes, which had been allied with the French, refused to submit to English authority. In 1763 a formidable league was formed under the leadership of Pontiac, a famous Ottawa chief. The country west of Niagara was devastated. All the British posts, excepting Detroit and Fort Pitt, were captured and the settlements blotted out. Next year a strong force was sent against the Indians, and they were reduced to submission.

French Congo, a possession of France in west-central Africa, situated between German Kamerun, Congo Free State and Lake Chad, Kanem and Wadai. The French were among the earliest explorers of the Congo region, and M. di Brazza, the Italian explorer, obtained large tracts of land from the native chiefs for France. French Congo lies on the northern bank of the Congo River, between the river and the Atlantic, including the region around Ubanghi River. Area about 680,000 square miles. Population estimated at 5,000,000. The capital, Libreville, has a population of 3,000; other towns are Loango, Franceville, Brazzaville and Fort de Possel. French Congo is divided into three colonies, under lieutenant-governors, with a general budget for the whole. The colonies are Gabun (capital Libreville); Middle Congo (capital Brazzaville); and Ubangi-Shari-Chad (capital Fort de Possel). The mineral resources embrace gold, copper and iron; while its exports (amounting in 1904 to about 14,000,000 francs) consist of rubber, ivory, various woods, palm-oil and kernels, coffee, cocoa, kola-nuts etc. There is considerable shipping-trade at Loango, but inland trade is hindered by lack of railways, though a line is projected to connect Libreville and the Congo. Brazzaville is connected with Loango by telegraph (715 miles), and another is being put up to connect with Leopoldville in Belgian Congo.

French Guinea. Lying between Portuguese Guinea on the north and Sierra Leone on the south, this French possession extends inland with a total area of 95,000 square miles and a population estimated at 1,498,000. The colony is self-supporting, the income and outgo balancing in 1907 at 5,300,000 francs. In 1905 the imports amounted to 18,924,814 francs, and the exports to 16,373,661 francs, these consisting chiefly of rubber, cattle and palm-nuts. A road has been driven from Konakry, the capital, to the Niger at Kurussa, and a railway has followed it as far as Kindia, 83 miles. There are 1,060 miles of telegraph. As elsewhere in French West Africa, governmental lay-schools are taking the place of those under the care of religious orders. French colonization began in 1685, but official occupancy by France did not occur till 1843.

French Language, The, is a development from the Latin spoken by the Romans who had conquered Gaul in the first century B. C. under Julius Cæsar. This Latin was not classical Latin, nor even the speech of the cities, but the more corrupt *patois* of the camps and rural districts. An undefined proportion of Celtic words was adopted into the rustic Latin, and thence found a path to modern French. In the fifth century, too, a Teutonic race known as the Franks overran and conquered Gaul, which had been completely Romanized. The conquerors, indeed, adopted the spoken Latin, but introduced about 400 Teutonic words. A few Greek words came into the French language from the Greek colonies at Marseilles and Nice. Thus in the seventh century the language of France had come to differ widely from Latin. It was now called Romanic.

The development of the French language now bifurcated into two parts. The French of the north was called the *langue d'oïl*, that of the south the *langue d'oc*. These two words, *oïl* and *oc*, meant *yes* in the north and south respectively. The *langue d'oc* developed into modern Provençal; the *langue d'oïl* into modern literary French. The former tongue achieved a wide celebrity during the 12th century as the language of the troubadours. New words were drawn into the French language during and preceding the Renaissance by almost direct adoption from the Latin. Italian and Spanish have each contributed several hundreds of words to French. The French language is now standardized and modified by the famous *Académie Française*, founded in 1635 and suppressed (for but a short time) in 1793. The chief recent modifications of the French language have been caused by an influx of scientific terms, largely Greek, and another influx of borrowed English words.

French Literature. See LITERATURE.

French Military Territories were three in number, but in 1904 were broken up. The second was handed over to the civil administration, the third and first amalgamated as the military territory of the Niger. See UPPER SENEGAL AND NIGER COLONY.

French Oceania. See NEW CALEDONIA and SOCIETY ISLANDS.

French Field Marshal Viscount, British soldier who distinguished himself in the Egyptian campaign (1884–85,) the Boer War (1899–1901), and the European War (1914–18).

He was born at Ripple in Kent on Sept. 28 1852, and early entered the navy, but exchanged into the army (1874), where he became noted as an excellent cavalry-officer. Before the outbreak of the Boer War (October, 1899) he was in command of the cavalry brigade at Aldershot, which he resigned to accompany Redvers Buller to take command of the British cavalry in Natal. He fought the battle of Elandslaagte, and later, under Lord Roberts in Orange River Colony, he raised the siege of Kimberley. In the European War (*q. v.*) he commanded England's first expeditionary force and was given the title of Viscount French of Ypres for his services in that battle.

French Revolution, The, a period in France, in the latter years of the 18th century (specifically between 1789 and 1795), of wild tumult and revolt, marked in the capital by the ungovernable and unnatural excess of a frenzied populace. The occasion of the violent outbreak was the effort of the nation, represented by the Third Estate in the states-general, which was convened in May, 1789, to free itself from absolutism in the monarchy and to secure the abolition of the privileged classes and of all the caste distictions and feudal abuses; the reform of the church; the reorganization of the national finances; and the reconstitution of the government. These things occurred when Louis XVI was king, surrounded by an extravagant and profligate court and by a corrupt and licentious nobility. The king, who had come to the throne in 1774, though well-meaning and recognizing the need of economy and reform, was weak and wanting in firmness for so new and exacting a situation. The financial situation, grappled with by Necker, might itself have been remedied but for the unwise interference of the king. Necker finally demanded the convocation of the states-general, which had not met since 1614. They met on the 5th of May, 1789, but as the nobles and clergy refused to recognize the Third Estate properly, the deputies of this body assumed the title of the national constitutent assembly and proposed to give France a constitution. The clergy and nobles yielded; foreign troops were brought to Paris; but the people flew to arms, and on the 14th of July the Bastille was captured and destroyed. On the fifth of October Versailles was attacked by the mob and the royal family were taken to Paris, virtually prisoners. A new constitution formed by the assembly was sworn to by the king on the 14th of September. This constitution deprived the king of arbitrary powers, providing liberty of worship and freedom of the press, of commerce and of industry. In accordance with the constitution the legislative assembly succeeded the constitutent assembly, meeting on Oct. 1, 1791. In this body there were two parties, the Girondists, moderate republicans, and the Montagnards, extreme radicals. The monarchists already were powerless. Threats of foreign intervention on behalf of the king led to a declaration of war against Austria and Prussia, April 20, 1792. With French reverses came a popular uprising, and the Tuileries, after a bloody combat, was taken and sacked. A national convention was convened in place of the assembly, and its first act was to proclaim a republic. The king was sentenced to death and was executed on Jan. 21, 1793. A committee of public safety, with sovereign authority, was appointed, and the Reign of Terror was begun. The Montagnards or Jacobins came into power, Christianity was formally abolished, opposing factions were put down with frightful bloodshed, the queen was executed on Oct. 16, 1793, the Girondists on Oct. 31, and the bloody work went on under the leadership of Robespierre. The Reign of Terror finally came to an end by the execution of Robespierre and his associates, July 27 and 28, 1794. In 1795 the convention gave the republic a new constitution and was dissolved on Oct. 26. Then arose Bonaparte and the diversion of the national mind by the campaign in Italy and the expedition to Egypt. The era closed with the return to France of the future idol of the nation, the rise of the consulate and, finally, the establishment of the empire.

French Somali Coast or **Protectorate.** See SOMALILAND.

French West Africa has had one general government since Oct. 1, 1902, being divided into the colonies of Senegal, French Guinea, the Ivory Coast and Dahomey and the territories of Senegal and the Niger, each of which is treated independently. Each colony has a lieutenant-governor under the governor-general of the entire tract, assisted by a secretary-general and a permanent delegate situated at Dakar. With the divisions mentioned are to be included the territories of the Upper Senegal, of the Middle Niger, and the Military Territory, toward which each of the four colonies contributes. In 1907 France expended 15,813,115 francs, most of it for military purposes. A loan of 65,000,000 francs has been contracted, the money to be spent in railways, harbors and sanitary work. Great Britain has ceded a port accessible to sea-going vessels on the Gambia, as well as the Los Islands, formerly belonging to Sierra Leone. By the convention of 1904 about 8,000 square miles had been taken from British and added to French territory, giving a better route from the Niger region to Zinder and Lake Chad.

Frere (*frâr*), Pierre Edouard, a French painter, was born at Paris, Jan. 10, 1819. He studied under Delaroche. His paintings are mostly figures and scenes from domestic life. They are good subjects for engraving, and are well known in art-stores. Ruskin was enthusiastic in praise of several of his works, which were shown in the French gallery in 1857. The *Seamstress, Little Gourmand, Preparing for Church* and the *Gleaner Boy* are among his best-known pictures. *Preparing for Church* is in Corcoran Gallery at Washington. He died on May 23, 1886.

Fresnel (*frā'nĕl'*), **Augustin Jean,** a French engineer distinguished as the principal founder of the modern wave-theory of light, was born in Normandy in 1788 and died near Paris in 1827. As a child he was not considered brilliant, but, nevertheless, he was ready to enter the Polytechnic school in Paris at 16. In 1816, through the influence of Arago, he received an appointment in Paris, where he remained during the rest of his life. When we recall that his first studies in optics date from 1814, his accomplishments during the 11 years of his Paris residence almost surpass belief. The great advances which he made over Grimaldi, Hooke, Huygens, Young and other advocates of the wave-theory consist in the introduction of the idea of transverse vibrations in the ether and in the combination of the principle of Huygens with that of interference. Fresnel's works were published in 1866 by the French government in three superb quartos.

Fresno, Cal., county-seat of Fresno County, on the S. P. and S. F. railways, is 15 miles west of San Joaquin River and in the exact center of San Joaquin Valley, the greatest raisin and grape producing region in the world. The value of the former crop is six millions annually. There are nearly 125,000 acres of grape vines in the county. Smyrna figs are also grown with success. Fresno is 200 miles southeast of San Francisco and is one of the best-equipped and most up-to-date of all the provincial cities of the state. The population is 48,000.

Freytag (*frītäg*), **Gustav,** a German novelist and play-writer, was born in Silesia, July 13, 1816, and died at Wiesbaden, April 30, 1895. He studied at Breslau and Berlin, and lectured on German literature in the University of Breslau. He edited a newspaper at Leipsic, and held a court-position at Gotha. He wrote poems, successful plays and novels. His best-known work is *Debit and Credit*, which has appeared in several English translations. *The Lost Manuscript* and a series called *Our Ancestors* were nearly as popular, while the plays, *The Valentine* and *Count Waldemar*, were brilliant successes.

Frick, Henry Clay, capitalist and manufacturer, was born at West Overton, Pa., on Dec. 19, 1849. He completed his education at Otterbein University, Ohio, and in 1869 accepted a position as bookkeeper in his grandfather's office at Broad Ford, Pa., where he soon became interested in the coking-coal deposits of that vicinity. He formed a company to buy 300 acres of coke-lands and start coke-ovens. The business grew rapidly, and he used the profits to buy more coke-and-coal lands. By 1882 the capital of this company, which bears his name, had been increased to $10,000,000. It now is probably the largest producer of coke in the world, and owns 40,000 acres of coal-lands.

In 1892 Mr. Frick became president of the Carnegie Steel Company, when it had a capital of $25,000,000. In that year much trouble was caused by a strike of its employees, in connection with which he was shot and stabbed by an anarchist. He recovered, however; carried the day against the strikers; and by his firmness, decision and fairness so won their approval that there was after that time very little labor-trouble in the companies with which he was connected. For several years preceding his death, December 2, 1919, he had retired from active business.

Friendly Islands or **Tonga Group** lie 250 miles southeast of Fiji. The total area is only 390 square miles. Most of the islands are coral formations, but some are volcanic. There are several active volcanos. Earthquakes are frequent. The islands were discovered by Tasman in 1643, and named by Cook in 1777. Among the products are tropical fruits, copra, coffee, sponges and cocoanuts. The native animals are few. Missionary work on the islands has, since 1827, been done by the Methodists. Almost all the islanders are Christians; many can speak English; and schools are numerous. The people are in many ways superior to the other South Sea islanders. But they are decreasing in numbers and have dwindled to 23,011. Since 1845 the islands have been under the rule of one chief, and they have a constitution and a parliament. By agreement of the European powers in 1896 the islands were allowed to remain neutral; but British interests have long been predominant, and the islands are a protectorate of Great Britain. The protectorate was declared in 1899, and in 1904 the British High Commissioner assumed control of the legal and financial administration. The revenue, chiefly derived from customs, amounted in 1910 to about $220,000, while the expenditures were $213,000. The trade (import and export) is chiefly with New Zealand, New South Wales and Great Britain. Two ships of the New Zealand Union Company visit the group every four weeks, between Auckland and Tonga, Samoa, Fiji and Sydney. See H. S. Cooper's *Coral Islands.*

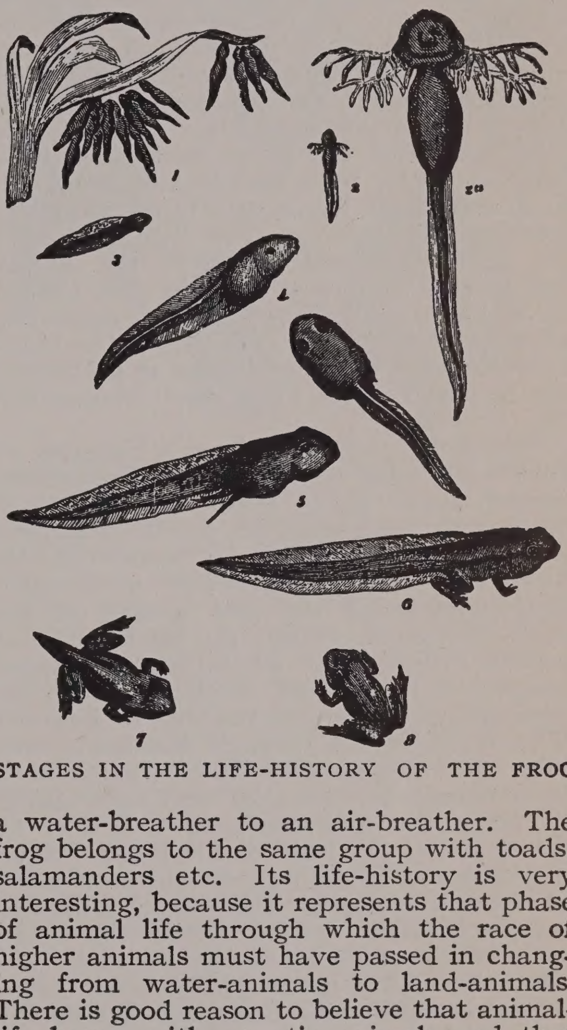
Friends, Society of. See QUAKERS.

Frigate-Bird, a sea-bird related to the pelicans, because of its warlike attitude toward other birds is known as the man-of war bird, though this name is given also to the albatross (*q. v.*) and other birds. It is very large, the spread of wings sometimes being ten feet, and has an extremely long, forked tail and a bill five inches long, hooked at the end. It has a pouch, which is inflated in flight and becomes bright scarlet during the breeding-season. In color the bird is blackish-brown with green and purple reflections; the feathers are much in use for headdress in the Pacific islands. Throughout the tropic regions the bird is met with, and it has been known to wander as far north as Nova Scotia. It is a true ocean-bird, seldom coming to land except to roost on trees near the breeding-quarters. The slightly-built nest is placed in a tree or bush, occasionally on the ground or bare rock, and contains one egg. It is said that both male and female incubate, sitting close together and snapping at any intruder. The flight of the frigate-bird is wonderfully swift and long-sustained. The birds are usually seen singly or in pairs. They do not dive for their prey, but with ease seize the surface-swimming birds that constitute their chief food; they also feed on squids, small crabs, flying fish and young turtles. They are adept as robbers, forcing terns and boobies to give up their prey and catching it before it reaches the water. It has been asserted that they pass from Africa to South America in a day.

Fro'bisher, Sir Martin, one of the great seamen of the age of Elizabeth, was born in Yorkshire about 1535. Sent to sea as a boy, he formed, at an early age, his lifelong dream of a northwest passage to Cathay. Following out this idea, he made three voyages to the region of Labrador. Later on he commanded a vessel in Drake's expedition to the West Indies, and covered himself with glory by his conduct in the struggle with the Spanish Armada. His later years were spent in scouring the seas for the treasure-ships bound from the New World to Spain. At the siege of Croyzon, near Brest, in 1594, he was wounded, and died at Plymouth, England on Nov. 7 of the same year. See *Life* by Rev. F. Jones.

Froebel (*frē'bel*), **Friedrich Wilhelm August,** a German reformer in education, was born in Thuringia, April 21, 1782. His early years were spent partly in study and partly in teaching, for which he had a marvelous fitness. His underlying idea in education was to follow nature in the unfolding of the pupil's mind; letting it grow and expand as a plant grows, according to its nature This idea he had an opportunity to carry out, when, in 1817, he opened a school at Griesheim, in Thuringia, which he soon transferred to Keilhau. He wrote a work explaining his views, and, with the object of extending his system, started several branch-schools and began to train teachers. In 1836 Froebel opened at Blankenburg, not far from Keilhau, his first kindergarten, a system of teaching children which has since become popular in all circles of education. The remainder of his life was spent in working out this new system. Froebel has exerted a great influence on education in this country, perhaps greater than either Pestalozzi or Herbart. His principal work is *The Education of Man*, translated by Josephine Jarvis. He died on June 21, 1852. For kindergarten see SCHOOL; MODERN EDUCATION; CHILD-STUDY; SELF-ACTIVITY; GAMES.

Frog, a common, tailless amphibian, with webbed feet, and hind legs adapted for leaping; hatching as a tadpole and passing from a water-breather to an air-breather. The frog belongs to the same group with toads, salamanders etc. Its life-history is very interesting, because it represents that phase of animal life through which the race of higher animals must have passed in changing from water-animals to land-animals. There is good reason to believe that animal-life began with aquatic animals and that the terrestrial animals sprang from them. As is well known to embryologists, all the higher animals pass through a stage, in the egg, in which they have rudimentary gill-slits and gill-arches, with blood vessels arranged on the fish-like pattern. (See DEVELOPMENT.) The frogs hatch at the level of a fish, and, while leading an independent life, they pass through the stages that higher animals pass before birth. Frogs and toads are much alike; in the



STAGES IN THE LIFE-HISTORY OF THE FROG

tadpole stage they live on vegetable matter, but, after the metamorphosis, catch insects, slugs etc. by a long, flexible tongue. When first hatched, the young tadpole has external, feather-like gills. Soon these disappear, and then internal gills are used in breathing. Then fore and hind limbs make their appearance, and the tadpole is a tailed frog. The tail disappears gradually; it does not drop off nor simply shrivel, but is used as food by the growing animal. Numerous, white blood-corpuscles creep through its substance, and carry minute portions of it forward for the nourishment of the animal, and thus it is gradually consumed. In the meantime great changes have been taking place in the internal organs — the lungs are developed, the system of blood-vessels is changed and the digestive system is made over into one fitted for animal food. The changes in the blood-system are very remarkable. Aortic arches disappear, and the heart changes from a fish-like heart, with auricle and ventricle, to an amphibian heart, with three chambers, intermediate between the fish-heart and the four-chambered heart of the higher animals. The largest frog in the United States is the bullfrog, which measures, when extended, 18 to 21 inches. The hind-limbs of frogs are much eaten as delicacies. See Marshall's *The Frog* and Dickerson's *The Frog Book.*

Froissart (*froi'särt*), **Jean,** a historian of the middle ages, was born at Valenciennes, France, about 1337. He was educated for the church, but spent his youth in gayety and dissipation. When 20 years old, he began his famous *Chronicle* or *History.* After completing the first section of his work, Froissart set out on his protracted travels in quest of adventure and good company. He visited England, where he became the favorite of the wife of Edward III. He traveled through Scotland with only his riding-palfrey and a greyhound as companions, where he was entertained by King David Bruce and the Earl of Douglas. In the train of the Black Prince he journeyed to Aquitaine, and soon after he is found in Italy. He became a curate, and for a while settled down, but again gave way to the old roving impulse. He ended his days as canon at Chimay in 1410. His famous *Chronicle* deals with the period between 1326 and 1400; and, though mainly occupied with the affairs of France and England, Scotland and Flanders, he likewise gives much valuable information in regard to Germany, Italy and Spain. He gathered his materials in courts and on highways, from the lips of lords and knights, squires and heralds. He was a born story-teller, and his pages glow with color. His book is the most vivid and entertaining of all medieval chronicles. He was the Herodotus of the middle ages.

Frond (in plants), a name chiefly applied to the leaves of ferns, under the impression that they are not like ordinary leaves, but are a combination of stem and leaf. The word is passing into disuse.

Fron'tenac', Compte de, was born in France in 1620, and died in Quebec in 1698. Becoming brigadier at an early age, he was appointed governor of the French possessions in North America and remained for ten years. The Indians feared him, yet he won their respect. The settlers trusted him. Parkman narrates how he crushed the Iroquois and freed the colony from their lawlessness. No more interesting incidents can be referred to in early Canadian history than those suggested by the name of Frontenac. Frontenac, a nobleman of long descent, representing the most powerful court in Europe, adapted himself readily to the new-world environment. He would carry a pack over a portage or push a canoe through the rapids as skillfully as a native. He is entitled to first place in the list of French governors. His first glimpse of the Great Lakes kindled a desire to extend westward the influence of France. Frontenac County on the north shore of Lake Ontario is called after him. Speaking of Count Frontenac, one writer says: "He twice rescued the colony from the destruction that seemed inevitable and changed the course of New World history by stemming the hostile tide that threatened to sweep French settlers and French influence alike out of the St. Lawrence basin."

A plan of Fort Frontenac (at Kingston, Ontario) made in 1787 can be seen in Abbé Foillions' *History of Ville Marie* (Montreal). The fort there shown was destroyed in 1689 by Governor Denonville, and restored by Count Frontenac in 1695.

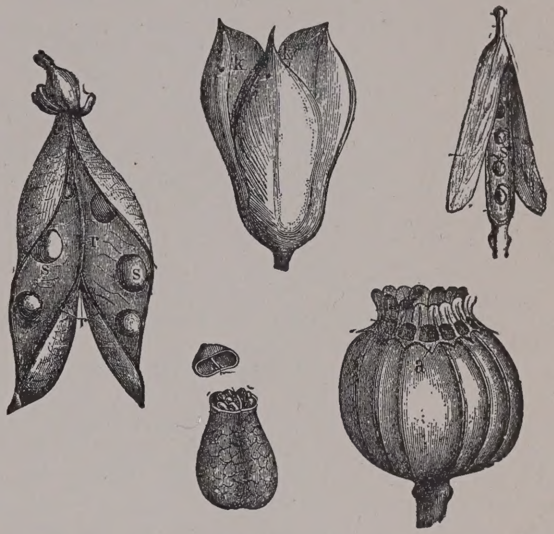
Frontenac County, on the north shore of Lake Ontario in the eastern part of Ontario, contains unsurpassed feldspar and mica-deposits, which extend to adjoining counties. A richly mineralized district, it possesses historical interest.

Frost, either the process of freezing or the crystals of frozen dew. These crystals are also called hoar frost. When air condenses at a temperature above freezing point (32° F.), the result is dew; but when the air contains so little water-vapor or is already at so low a temperature that condensation does not take place until the temperature is below freezing point, the result is frozen dew or frost. The most remarkable formations of frost are seen on the crest of Mount Washington during the autumn and winter, when crystals a foot or more in length fasten themselves to every object. The destructive effects of frost on tender plants are well-known. When plants radiate or pass off their heat faster than it can be supplied from the air around, they are frosted. This is most likely to happen on clear nights, as the clouds act as a screen to check radiation. Smoke acts in the same way as clouds, so that frost is more common in country districts than in towns. A well-known form of frost is the frost-work or ice-crystals seen when the moisture in the air of a warm room condenses on the glass of the window, the glass being below freezing point. Black frost is the effect produced when the moisture within a plant is frozen, but without any hoar frost being formed on the outside.

JAMES A. FROUDE

Froude (*frōōd*), **James Anthony,** an English historian, was born at Dartington, Devonshire, April 23, 1818. His early literary work appeared largely as contributions to magazines; but in 1856 appeared the first volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada.* Later on he published four volumes of brilliant essays entitled *Short Studies on Great Subjects.* Among more recent works are a sketch of *Julius Caesar* and *Oceana*, the latter an account of a voyage to Australia and some of the Pacific islands. In 1873-74 appeared *The English in Ireland in the Eighteenth Century.* Froude was for some years rector of St. Andrew's University and editor of *Fraser's Magazine.* In 1892 he was appointed regius professor of history at Oxford. Froude had fine literary ability, and in the art of making history as fascinating as fiction Macaulay is his only rival; but he lacked the critical fairness and accuracy of modern historians, a fault which greatly impairs the permanent value of his works. He died on Oct. 20, 1894.

Fruit. When seeds are formed, contiguous parts become more or less modified, and the resulting structure is called a fruit. The parts involved in a fruit vary widely in different plants. Sometimes only the ovary is involved, as in the bean-pod; sometimes the cup-like part of the flower which bears the floral leaves is included, as in the apple; sometimes the very much enlarged receptacle is included, as in the strawberry; while in the pineapple the fruit is the whole flower-cluster, with its axis, bracts, flowers and all. Fruits may be roughly classified in two groups: (1) those which ripen dry and (2) those which ripen fleshly. The dry fruits are further divided into those which dehisce, that is, open in some way to discharge the seeds, and those which do not dehisce, the fruit being carried away with the seed. Among dry fruits which do not dehisce are the akene (sometimes spelled achene), in which a single seed is so closely invested by the ovary as to make a seed-like fruit, as in the sunflower, dandelion, strawberry pits, etc.; and the characteristic grain of wheat, corn and other cereals. Among dry fruits which dehisce, called in general pods, are the follicle, a single ripened carpel which splits down one side, as in the peony; the legume (generally called pod), a single ripened carpel which splits into two parts (valves), as in the pea and bean; the capsule, a ripened pistil of several carpels which opens in various ways, as in the hollyhock and violet; the silique, the peculiar pod of the mustard family, with a false partition; the silicle, a short silique; the pyxis, a capsule which opens by a lid, as in the twin-leaf (*Jeffersonia*). The fleshy fruits do not dehisce, and among them are the berry which is pulpy throughout and with a thin rind, as the grape, currant, tomato etc.; the drupe or stone fruit, in which the ovary wall develops an outer fleshy part and an inner bony part (stone), the seed being the kernel, as the peach, cherry, plum etc.; the drupelet, a small drupe, as the grains of the blackberry, raspberry etc.; the pome, in which certain flower-parts outside the ovary form the flesh, as the apple, pear etc., the ripened ovary being the core.

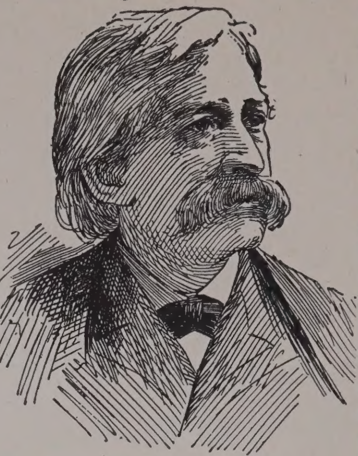

VARIOUS FORMS OF DRY, DEHISCENT FRUIT

Fry, Elizabeth, was born on May 21, 1780, near Norfolk, the daughter of John Gurney, a banker. She had no deep religious opinions until, at 18, a sermon she heard in the Friends' meeting-house turned her thoughts in that direction. She began working among the poor, and founded a school for poor children, which she managed entirely herself, even when the number of scholars increased to more than 70. She married, and later became a preacher among the Friends. In 1813 she first saw the miserable condition of the 300 women, with their children, in Newgate Prison, and her attention was turned to prison-reform. By her efforts a school and manufactory were begun in the prison, an association formed to improve the prisoners and provide them with religious instruction, and a matron was appointed. Mrs. Fry visited prisons in different parts of Great Britain and on the European continent, everywhere effecting ameliorations. She died at Ramsgate, Oct. 12, 1845. See *Life* by Mrs. Pitman.

Fuegians (*fū-ē'jĭ-an*), or inhabitants of Tierra del Fuego are an interesting race, having a language or, rather, several languages different from all other known tongues. Several tribes are to be distinguished among them, including the Ona in the northwest, the Aliculuf in the center and the almost extinct Yahgans. All these tribes are ill-clothed and sheltered, yet skilled in basketry and in the making of weapons and canoes. It is likely that they will before long be extinct, for the owners and herdsmen of sheep are making sad havoc among them.

Fugitive-Slave Laws, The, were laws formerly in force in the United States to enable slave-owners to reclaim slaves who had escaped from them into another state. As slavery was a state affair, being recognized in some states and not in others, the logical outcome seemed to be that a slave ceased to be a slave when he entered a state in which slavery was not tolerated. This was true, unless one held strictly to the view that a slave was simply the private property of the owner, in which case the private property could be recovered through the intervention of Federal officials. On the assumption that a slave was private property, the Fugitive-Slave bill of 1793 was passed, giving the alleged owner the right to seize a person whom he could prove, before judge or local magistrate, to be his fugitive slave, and remove him to his own state. This law was much abused by kidnappers of free negroes, since a negro so seized was practically at the mercy of one who was willing to swear that he was his escaped slave, and the alleged slave was debarred from the right to demand a writ of *habeas-corpus* or a trial by jury.

Meanwhile states prohibiting slavery in some instances passed laws with a view to nullifying the laws permitting slave-extradition in this fashion, on the ground that state laws were here supreme. This led to much agitation on the part of slave-owners, and led to the passing of the Federal law of 1850 which denied the right of a slave to a writ of *habeas-corpus* or a trial by jury, and placed the enforcement of the law entirely in the hands of the officials of the Federal government. This second fugitive-slave law was repealed in 1864.



MELVILLE W. FULLER

Fuller, Melville Weston, chief-justice of the supreme court of the United States, was born at Augusta, Me., Feb. 11, 1833, and graduated from Bowdoin College and Harvard Law School. In 1855 he was admitted to the bar and practiced for a time at Augusta, Me., but removed to Chicago and pursued his profession there until 1888, when he took the oath of office as chief-justice, the post being offered him by President Cleveland. In the sixties he was a member of the Illinois state legislature, and was repeatedly delegate to the Democratic national conventions. Bowdoin College, Northwestern University and Harvard each conferred upon him the honorary degree of LL.D. He died July 4, 1911.

Fuller, Sarah Margaret, Marchioness Ossoli, an American author, was born at Cambridgeport, Mass., May 23, 1810. After the death of her father, a lawyer and congressman, she supported herself for some time by teaching. Later on, in Boston, she edited *The Dial.* In 1844 she wrote *Women in the Nineteenth Century*, and in the same year, at the invitation of Horace Greeley, she went to New York and contributed articles to *The Tribune*, which were afterwards collected as *Papers on Literature and Art.* She afterwards went to Europe, and in 1847 met at Rome the Marquis Ossoli, to whom she was soon after married. She entered with enthusiasm into the struggle for Italian independence. In 1849, during the siege of Rome, she took charge of a hospital; and, on the capture of the city by the French, she and her husband and their child, after a period of hiding, set sail for America in 1850. The vessel was driven on Fire Island, near New York, by a violent gale in the early morning of July 16; the child's body was found on the beach; but nothing was ever seen afterward of Margaret Fuller or her husband. See *Life* by T. W. Higginson.

Fulton (*ful'tŭn*), **Robert.** When Robert Fulton launched the first steamboat, the *Clermont*, on the Hudson River, in 1807, his old friends in Lancaster, Pennsylvania, probably were not surprised. They had always expected the quick-witted, ingenious Irish boy, who had grown up among them, to do something remarkable, and they were proud and glad of his success. He had been such a manly, good-tempered handsome boy, that everyone who knew him, loved and admired him. A busy city of 50,000 people to-day, Lancaster, at the time of the Revolutionary War, was only a farming village in the rich valley of the Susquehanna. The Dutch and Quakers who dwelt there were very sober people and prone to be critical of conduct; so Robert Fulton, the lively, imaginative son of poor Irish immigrants, must have been an exemplary youth to have won their approval.

This inventor of the steamboat was born on November 14, 1765, on a farm in what now is Fulton township, but the family soon afterwards moved to town and, the father dying, was left to a rather precarious manner of living. At a very early age Robert was earning money by painting miniatures, so the prediction was freely made that he was to become as famous a painter as Benjamin West, a Quaker boy who had gone to London. Many held to the opinion that the boy was to be an inventor, for his talent for mechanics was equally well-marked in boyhood. He powdered lead and made his own pencils; he attached a paddle-wheel, worked with a crank, to his pole-boat, so as to leave himself free to fish; he pulled heavy loads up a hill by means of an inclined plane and a windlass; and he made his own rockets for celebrating the Fourth of July. He designed guns for the gunsmith and then calculated how far they would shoot. For the making of these boyish devices he had to study mathematics and physics, and he applied the same principles that he used in later inventions. Besides, he learned everything he could from practical workmen. The smith, the chemist and the miller delighted to talk to him, because he asked no idle questions, and he never broke or mislaid a tool he was permitted to use. For a long time he was making mysterious experiments with mercury, and so got the nickname of Quicksilver Bob, which so accurately described his active fingers and brain that the name stuck to him, even after he became famous.

At 17 Fulton went to Philadelphia to study art. So well did he use his time and talents that at 21 he had $400 to invest in a farm for his mother and sisters. He took the long journey across the Alleghanies and back to see them comfortably settled, before going to London to continue his studies under Benjamin West. It was this act of filial duty that turned his thoughts from art to engineering. He had seen many rich valleys that were unsettled because farm-produce could not, except at great expense, be brought out of them to market. The locomotive was not yet invented. Everyone expected that a network of canals was to solve the transportation-problem, with horses on a tow-path pulling huge flat-boats. But Fulton already had the idea of using steam instead of horse-power. On the ocean there was the further necessity of protecting the carrying trade from interference by powerful navies. So the ideas of better and cheaper canals, of swifter travel by steam and of explosives began to occupy his mind, although he continued to paint. He was slowly winning recognition as an engineer and inventor by the substitution of cast-iron for stone in aqueducts and the introduction of the inclined plane, in place of locks, in small canals. He also invented a dredging-machine, a marble-cutter and a flaxspinning frame.

A man less in earnest would have had his head turned by his popularity in London and Paris, but he used his social success to further his serious plans. He invented a torpedo to be fired from a submarine or diving boat and set off by clock-work. That France failed to see the value of the invention was one of those curious instances of shortsightedness in men and governments. Fulton's patriotism was shown by his refusal of an offer for the secret from England. Had the United States purchased the invention and set Fulton to perfecting it, the War of 1812 might have been avoided or much shortened. Disappointed in getting recognition for his torpedo, Fulton turned his attention to the steamboat. The stationary engine of James Watt was then in general use in England, in mine and mill and factory. The inventor's mind recurred to the pole-boat in which he had fished on the Susquehanna and the paddle-wheel he had devised to propel it. Why could not a paddle-wheel of any size be turned by steam-power? Theoretically it could, but there were many steps to be taken, long years of experimenting and much money required to put this simple idea into practical use. The first boat, built on the Seine at Paris, broke in two from the weight of the engine and sank. The second boat had too small an engine for the load. But Fulton learned success by failure. In 1806 he had an engine constructed in England after a special design and shipped to New York. He knew how to make the steamboat, and he wanted to launch the first one in his native country, on the Hudson.

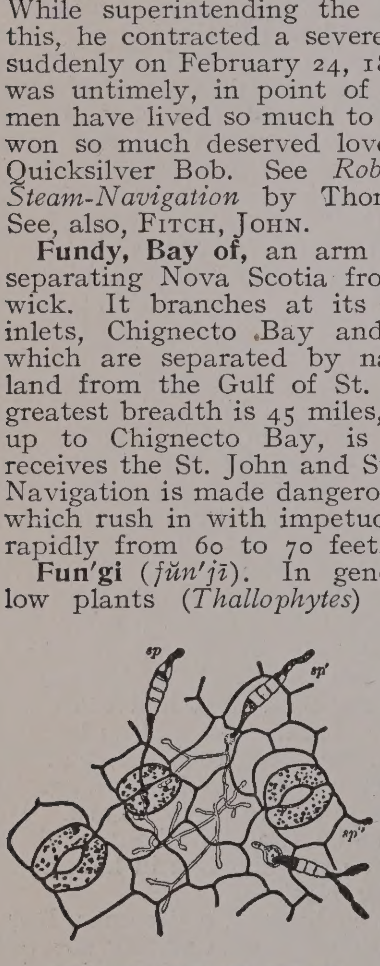
Although an enthusiast, a dreamer, Robert Fulton was determined, untiring, shrewd, practical. He had money of his own, and he interested other men of wealth and influence who secured a monopoly of traffic by "fire-boats" on the waters of New York. When he began to build the *Clermont* on East River, it was ridiculed as Fulton's Folly. Beside the graceful sailing-vessels on the river, the paddle-wheel steamer "looked like a back-woods saw-mill mounted on a scow and set on fire," as Robert Livingston wittily described it. But the inventor persuaded a party of prominent men and women to make the trial-trip with him to Albany. His guests slept in hammocks hung on deck; Fulton, too excited to sleep, watched the machinery during the entire 30 hours. What were his thoughts as he listened to the business-like *chug-chug* of the engine, the splash of the paddles, and watched the smoke and sparks from the pine-wood fire trail back over the dark Hudson?

The inventor leaped into instant fame, steamboats could not be built fast enough to satisfy the demand, nor one be made perfect enough to satisfy its maker. He busied himself with planning the Erie Canal besides, and became an authority on explosives. When the War of 1812 broke out, he was commissioned by the government to build the first steam naval vessel. While superintending the construction of this, he contracted a severe cold and died suddenly on February 24, 1815. His death was untimely, in point of years, but few men have lived so much to the purpose, or won so much deserved love and honor as Quicksilver Bob. See *Robert Fulton and Steam-Navigation* by Thomas W. Knox. See, also, FITCH, JOHN.

Fundy, Bay of, an arm of the Atlantic, separating Nova Scotia from New Brunswick. It branches at its head into two inlets, Chignecto Bay and Minas Basin, which are separated by narrow necks of land from the Gulf of St. Lawrence. Its greatest breadth is 45 miles, and its length, up to Chignecto Bay, is 140 miles. It receives the St. John and St. Croix Rivers. Navigation is made dangerous by the tides, which rush in with impetuous force, rising rapidly from 60 to 70 feet.

Fun'gi (*fŭn'jī*). In general, fungi are low plants (*Thallophytes*) which do not contain chlorophyll, in contrast with the algæ, which do. As a consequence fungi cannot manufacture their own food out of raw materials, as do the algæ, and are dependent for it upon other plants or upon animals. In obtaining this food they have cultivated two habits. Some are parasites, that is, they prey upon living plants and animals, which are then called hosts. Some of the parasitic fungi are very injurious or even destructive to their hosts. They may grow upon the surface of the host, sending suckers into the body as in the common mildews; or they may burrow within the body of the host, as in the wheat-rust. Parasitic fungi destroy an immense number of useful plants and animals and also many other plants and animals to which we pay no attention. Other fungi are *saprophytes;* that is, they use for food decaying bodies of plants and animals or the products of living bodies. For example, the common mushrooms use decaying vegetation; the common blue-mould grows on old bread, jars of fruit etc. Saprophytes in general are beneficial, since they are great scavengers. Some fungi may be either parasites or saprophytes as occasion demands. The body of an ordinary fungus is a more or less interwoven mass of delicate threads, called the mycelium (plural mycelia), the individual threads being called hyphæ (singular hypha). It is the mycelium of the parasitic forms which spreads on the surface of the host or burrows into its tissues. The four prominent groups of fungi are the *Phycomycetes*, containing such forms as the black-moulds and downy mildews; the *Ascomycetes*, containing the mildews, blue moulds, truffles, cup-fungi and probably the yeasts; the *Æcidiomycetes*, containing the rusts and smuts; and the *Basidiomycetes*, containing the mushrooms, toadstools and puff-balls. See the names of these groups.

JOHN M. COULTER.

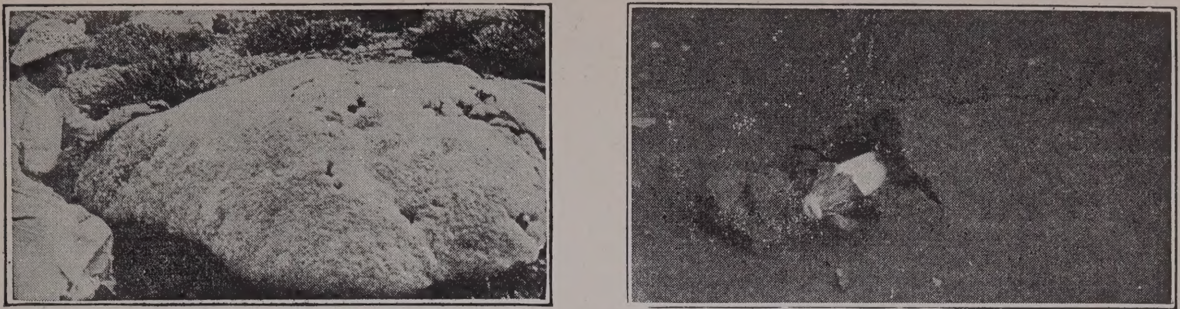


GERM TUBES OF FUNGI

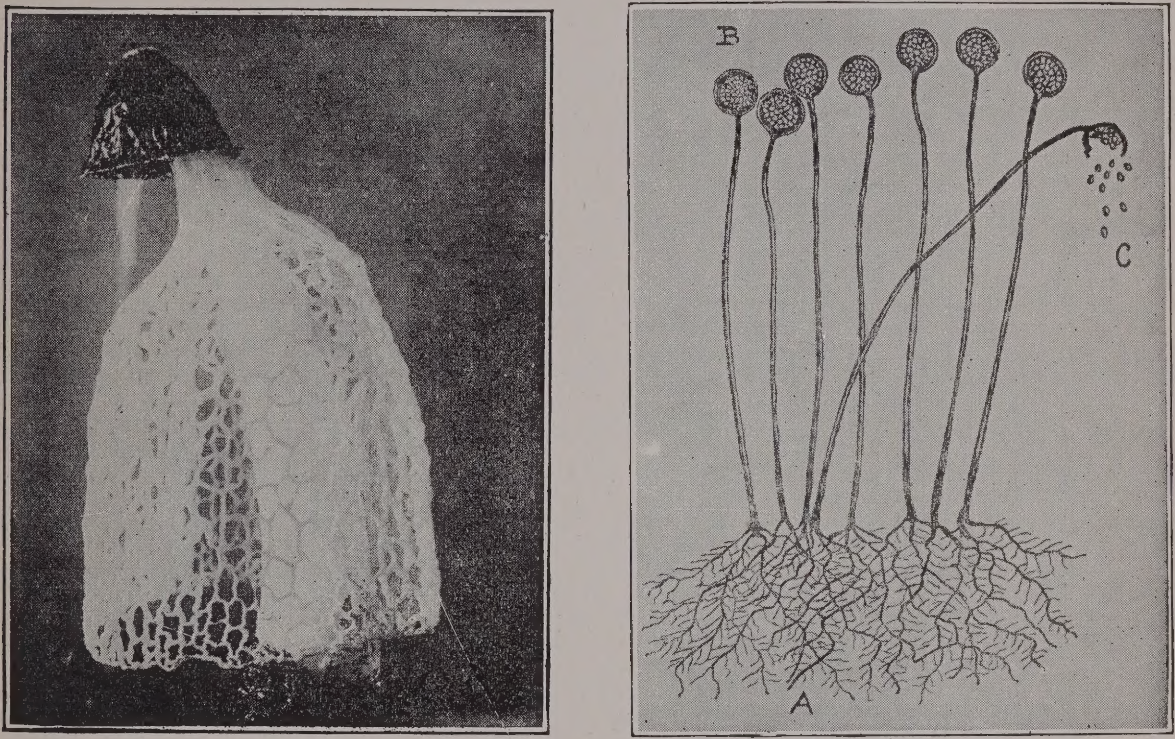
Part of the surface of a leaf showing the cells of the epidermis (outlined by solid lines), with three stomata. *sp*, *sp'*, *sp''* are three spores of a fungus, germinating. The germ tubes from *sp* and *sp'* are entering stomata; that from *sp''* is penetrating the cell wall.

Fur is the covering of certain animals, especially those that inhabit the lands or waters of cold countries. It is distinguished from hair by its greater softness and fineness. Furs are among the first materials used for clothing and also for covering couches and the floors of tents. They early became an important article of trade in Europe, and were used a great deal by the higher classes. One French king used 746 ermines for the lining of one of his coats. In North America there always has been a large trade in furs. Forts were established to protect and control the trade, and the great Hudson Bay Company grew up, which acquired control over a vast territory but now is a trading-company. The furs collected are sold at the great half-yearly sales of the company in London. The fur-trade has played an important part in the settlement of the northwest. One of the most prominent men engaged in it was John Jacob Astor, who founded Astoria. (See ASTORIA.) The purchase of Alaska in 1867 opened to Americans a new field for the fur-trade. The furs from this territory are mostly those of the fur seal, the otter and general furs, as those of the beaver, fox, marten and bear. The yearly value of this fur-trade is over $1,200,000, and the government receives a tax of over $300,000 for the taking of seals. The most fashionable and costly fur of all

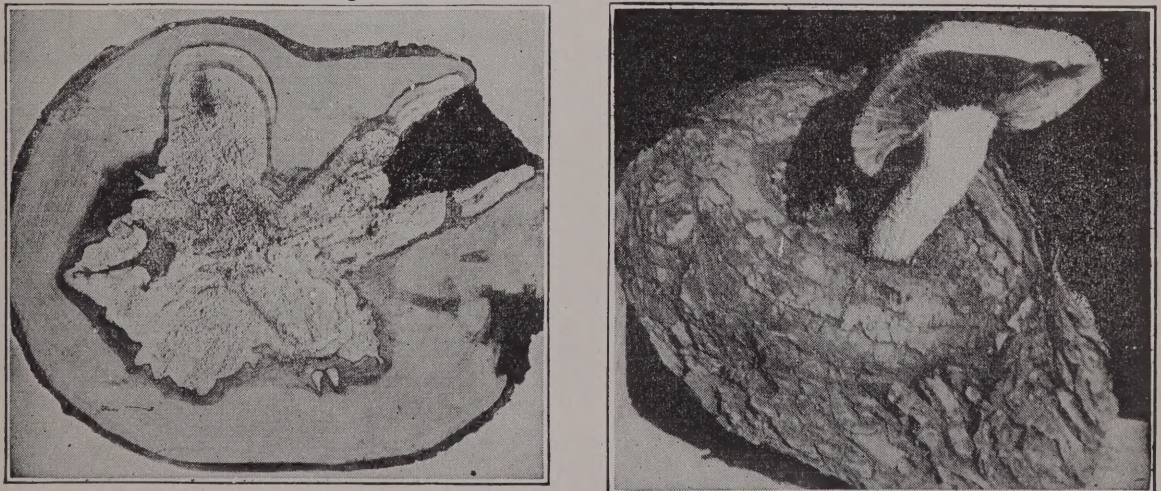
SOME PRANKS OF FAIRY FUNGI



This lady is sitting beside a "vegetable sheep"—a huge fungus of New Zealand. On the right is a photograph of a fungus which broke through a weak spot in an asphalt pavement. What is called "growth pressure" is known to reach 20 atmospheres, or 300 pounds to the square inch.

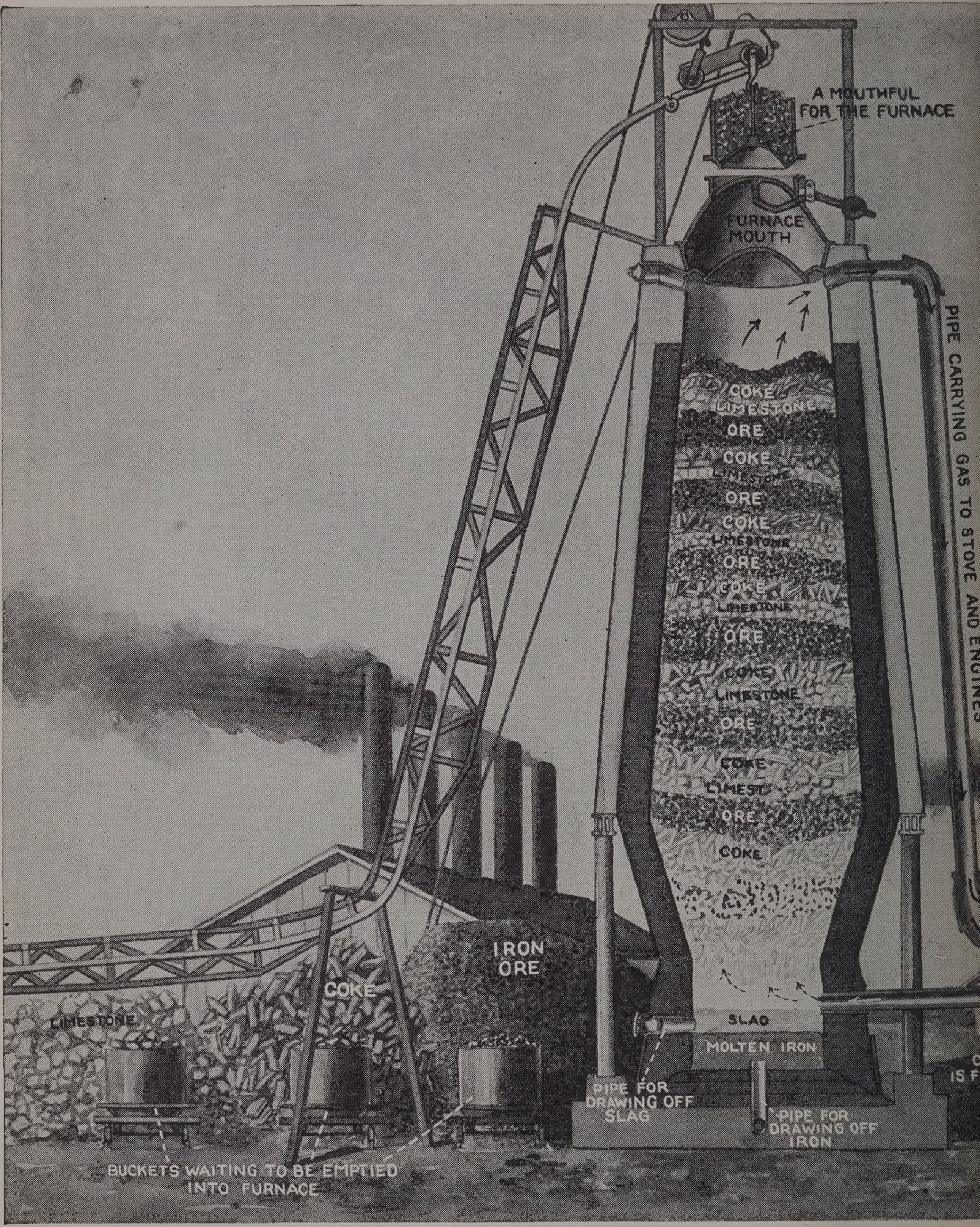


This curious fungus is found in the jungles of Java. It is called the "net bearer." Why? The illustration on the right shows how the common fungus grows—"A" roots; "B" fruit; "C" how the spores are scattered.



Here are two ways in which the fungus attacks and helps to destroy our beautiful trees.

THE BIG STOVES THAT COO


A MOUTHFUL FOR THE FURNACE
FURNACE MOUTH
PIPE CARRYING GAS TO STOVE AND ENGINES
COKE
LIMESTONE
ORE
COKE
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COKE
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COKE
LIMESTONE
ORE
COKE
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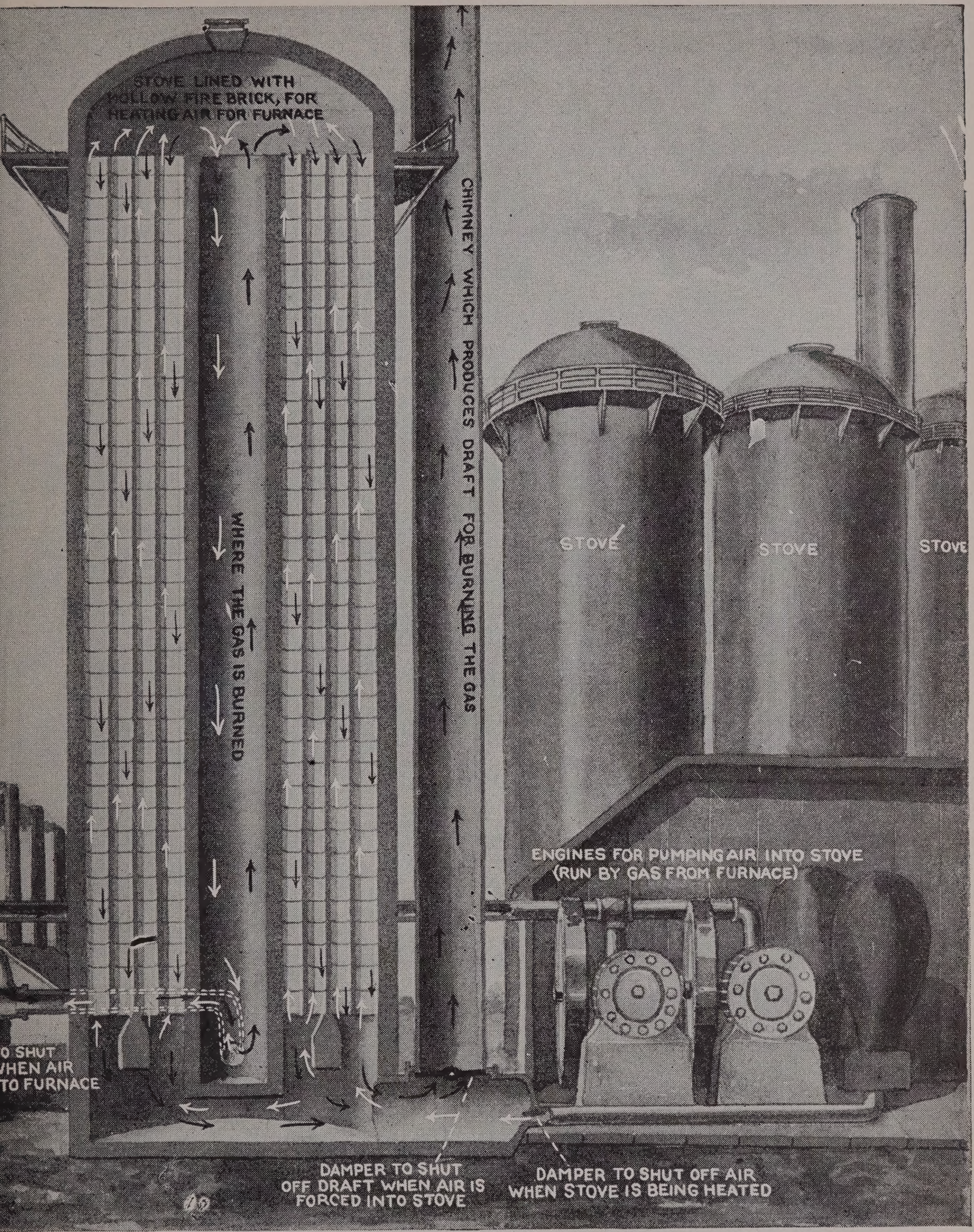
ORE
COKE
IRON ORE
COKE
LIMESTONE
SLAG
MOLTEN IRON
PIPE FOR DRAWING OFF SLAG
PIPE FOR DRAWING OFF IRON
BUCKETS WAITING TO BE EMPTIED INTO FURNACE
C
IS F

The manufacture of iron and steel, the greatest of human industries, starts in the melting of the iron out of the ore in the big "cannon stove," called the blast furnace. The ore is put into the furnace in layers alternating with coke and limestone. The coke starts the melting of the iron, while the limestone unites with t impurities in the ore, and these impurities being light than iron, rise to the top, like cream on milk, and a drawn off as slag.

Now this fire in the blast furnace creates a gre

THE IRON OUT OF THE ORE


STOVE LINED WITH HOLLOW FIRE BRICK, FOR HEATING AIR FOR FURNACE
CHIMNEY WHICH PRODUCES DRAFT FOR BURNING THE GAS
WHERE THE GAS IS BURNED
STOVE
STOVE
STOVE
ENGINES FOR PUMPING AIR INTO STOVE (RUN BY GAS FROM FURNACE)
O SHUT
HEN AIR
TO FURNACE
DAMPER TO SHUT OFF DRAFT WHEN AIR IS FORCED INTO STOVE
DAMPER TO SHUT OFF AIR WHEN STOVE IS BEING HEATED

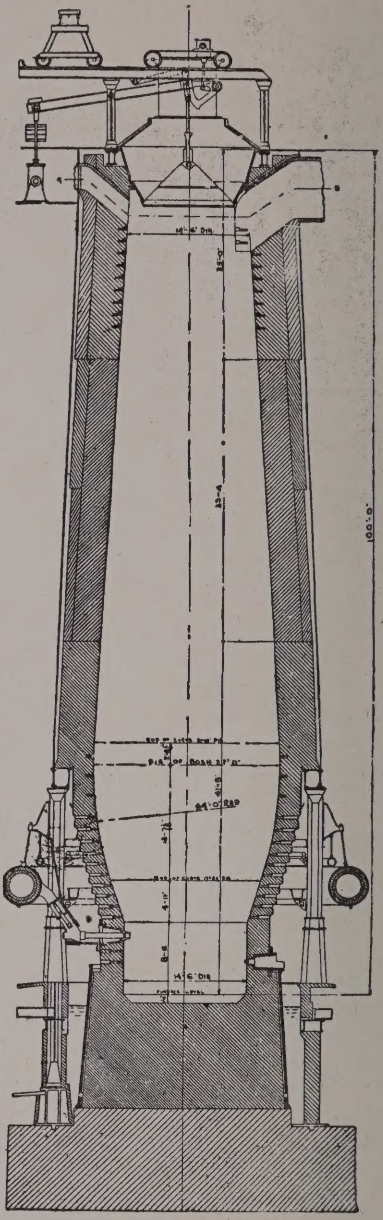
of gas which is piped from the top of the furnace another big stove and into a gas engine. The gas ch is burned in the stove heats the air in those nnels in the fire brick as it passes through, and the engine pumps this heated air back into the blast furnace so that the ore melts much faster than if the fires were kept up by cold air. The black arrows show the course of the gas, the white arrows the course of the air. Each blast furnace requires several stoves, you see.

is the Russian sable, some of the finest of which sell for over $200 apiece. Among other furs now sold are those of the black bear, badger, beaver, chinchilla, ermine, fox, leopard, marten, mink, raccoon, skunk, squirrel, wolf and wolverine. The usual mode of dressing furs is by steeping them in liquor for a short time, after which the pelts are "fleshed" over a sharp knife to get rid of the excess of fat, etc. and then dried off; they are next trodden by the feet in tubs of warm sawdust and common butter, by which the pelt or leather is made supple; the skin is then finished in dry sawdust and beaten out.

Furies, The or **Erinys, Diræ** and **Eumenides,** were, in Greek mythology, female divinities who were avengers of iniquity. These goddesses were daughters of Night, or, according to another myth, of Earth and Darkness, who sprang from the blood of the mutilated Uranus. Their number varied, but they usually are spoken of as three: Megæra (the grimly jealous), Alecto (the unwearied persecutor) and Tisiphone (the avenger of murder). Nothing, it is said, escaped their sharp eyes as they pursued the evil-doer with speed and fury, permitting him no rest. They were variously represented, at one time as female figures of odious aspect, clad in black, sometimes winged, with hair formed of vipers and carrying a serpent, a knife or a torch; at another time, they were characterized as divine beings, whose functions were to punish neglect of duty and breach of faith, yet who were looked upon as preservers of a high morality and hence were called Eumenides or the well-minded goddesses. Their abode was Colonos, near Athens.

Fur'nace, in general any arrangement in which heat is produced by burning fuel. It usually is a structure of iron or brick, lined with fire-brick to withstand intense heat. Furnaces are used for domestic purposes, as heating and cooking; for motive-power, as for steam-boilers; and for metallurgical and chemical processes. For heating and power purposes, see HEATING AND VENTILATION and BOILERS.

Furnaces used in metallurgy are of two kinds: (a) those in which the burning fuel and material to be heated are mixed and (b) flame-furnaces, where the fire-grate is separate from the flame-chamber or working-chamber in which the materials to be heated are placed. The common blacksmith forge is a simple example of the first class. Blast-furnaces and cupolas also belong to this class. A blast-furnace is a vertical structure in which ores of iron are roasted and smelted in contact with suitable fuel and fluxing-materials. The burning of the fuel is accelerated by a blast injected under pressure through openings called tuyères near the bottom. The dimensions of the furnace are such as to produce a thorough mixture and heating of the materials. In all modern blast-furnaces the blast is heated to a high temperature before being forced into the furnace. Blast-furnaces are from 60 to 100 feet high and from 20 to 25 feet in diameter at the middle. The narrowest parts are at the bottom and top. The fuel and the ore with certain fluxes, usually limestone, are introduced in alternate layers at the top. The melted metal gathers at the bottom and is drawn off to be cast into "pigs" or, in many modern furnaces, to be passed directly to the Bessemer converters to be made into steel. There also is formed a slag at the bottom from the melting of the limestone and earthy matters of the ore. This slag floats on the iron and is drawn off separately. The gases are burned to heat the blast and also to run gas engines. Formerly part of the gas was burned under boilers for the generation of steam power. The output of some of the great American furnaces is very large. That of two furnaces near Cleveland, O., is 600 tons each in every 24 hours.



BLAST FURNACE

The reverberatory furnace is a furnace of the flame-class. The flame-chamber is arched in order that the heat may be reflected and concentrated upon the work on the hearth, and hence comes the name reverberatory. These furnaces are used in metallurgical processes, particularly in handling steel. See STEEL.

The amount of heat utilized in most furnaces is a very small part of the whole produced by the burning of the fuel; the greater part is lost in the escaping gases and in connection with radiation. In most furnaces not over two or three per cent. is utilized. In flame-furnaces this rises to 15 or 20 per cent., and in some blast-furnaces it may rise to 80 per cent.

Furniture-Manufacture. This industry at the present day flourishes more in America than elsewhere. There is, however, no special form or style of furniture recognised as more correct than another. Steam was first applied to the making of furniture in 1815. Several historic styles are still followed in furnituremaking, including the light Chippendale, the heavy mahogany, the elaborate rococo, the severe Gothic and the Spanish-mission style. By 1850 most ordinary furniture was machine-made, for scrolls and ornaments could be readily and cheaply wrought into it by the machines. The best cabinets, however, continued to be made by hand. The great centers of the furniture-industry in the United States are New York, Chicago and Grand Rapids, Mich.; but six other cities in the United States produce furniture to the value of over $2,000,000 yearly. In respect of design America is responsible for many useful contrivances in the manufacture of furniture, including principally folding-beds and rocking-chairs. But lovers of artistic furniture complain that the use of machinery has led to the sacrifice of good taste to economy of production. The recent extension of the teaching of woodwork in American schools is likely to elevate the standard of taste and workmanship in the furniture-manufacture.

Furs. The history of the development of Canada, of the earlier struggles between the French and English for possession, of the opening of the northwest, which is still going on, and of exploration is largely the history of the fur-trade. Though the pursuit of fur-bearing animals has long ceased to be one of the principal industries of Canada, it in 1906 exported no less than $2,464,337 in furs alone. See Hudson Bay Company.

Fusiyama or Fujiyama (*jōō'jē-yä'mȧ*), a sacred volcano, the loftiest mountain of Japan, stands on the main island, about 60 miles southwest of Tokio. It rises some 12,200 feet above the sea, with a crater 500 feet deep. Its last eruption was in 1707. The cone is free from snow only from July to September, when thousands of white-robed Buddhist pilgrims make the ascent easily enough. A traveler visiting Japan was asked: "Have you seen it?" "What?" he said. "Oh, it; when you see it, you will know it." And one day when the clouds that had been covering the sky broke away, he saw high up in the heavens the snow-capped peak of Fujiyama, looking like a fairy castle floating on a bank of clouds, and exclaimed, with as much enthusiasm as the Japanese themselves: "Oh! I've seen it! I've seen it!"

Fuze, a means of igniting an explosive at the required instant, whether it is used in blasting, military operations and mines or as the bursting charge of a shell or bomb. It is of two kinds. One is the instantaneous, the other the ordinary fuze, the first burning at 30 feet a second, the other at three feet a minute. The ordinary fuze consists of a train of gunpowder in layers of tape covered with gutta-percha; in the instantaneous fuze, which is distinguished by crossed threads of orange worsted outside, quick match takes the place of gunpowder. Powder-hose is sometimes used when no other fuze is available. It is made of strips of linen, forming, when filled with powder, what is called a sausage, one half to one inch in diameter.

The fuzes used for shells are of a totally different character and of many patterns They are of two classes those which depend for their action upon the rate of burning of the composition in them, called time-fuzes; and those which burst the shell on its striking the target, ground or water, and called percussion-fuzes. Time-fuzes are hollow, truncated cones of beechwood, carrying a column of fuze-composition, which burns at a fixed rate. Marks and figures on the outside show twentieths of a second or less, and indicate where the hole must be made by a fuze-borer in order that the flame may have access through it to the shell at the desired instant during its flight. Time-fuzes are chiefly used with shrapnel shell and mortars. Their length varies from three to six inches, and they are fixed into the head of the shell before firing. The thickness of iron would prevent the passage of the flame through the hole made by the borer in the shorter fuzes, and, therefore, two or more powder-channels are made in them, parallel to the fuze-composition, to communicate its flame to the bursting charge. In guns having windage, that is, in which the ball is smaller than the bore of the gun, the fuze is ignited by the flame of the cartridge enveloping the shell, and quick match is placed on the top of the fuze to facilitate this. A metal-cover protects the quick match until the last moment and is then torn off by means of a tape provided for that purpose. In guns having no windage a percussion arrangement is placed in the head of the fuze, so that the shock of the discharge may ignite the fuze composition. Fig. 1 shows a section of the

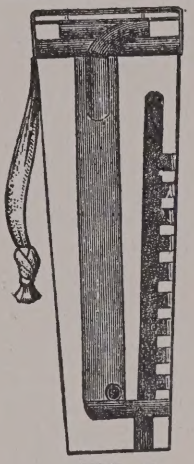


FIG. 1

common time-fuze, through one powder-channel. A section of the percussion-fuze is shown in Fig. 2. It is a hollow, gun-metal cylinder (*a*) so arranged as to screw into the head of the shell. Inside is a movable pellet or ring (*b*) of white metal, driven with fuze-composition like a tube and carrying a percussion-cap. It has four feathers or shoulders projecting from its sides, and above these a gun-metal guard (*c*) fits round the pellet loosely, so as to prevent the cap of the pellet from coming in contact with a steel pin which projects downward from the top of the fuze. A safety pin (*d*) goes through the fuze with the same object, but is removed before firing, and a lead pellet (*e*) then closes the aperture left by its removal On discharge, the shock of impact on the target or ground causes the pellet to set forward, bringing the cap against the pin, igniting the fuze composition and bursting the shell. Percussion fuzes are used chiefly with "common" shell. Very many others are in use, chiefly modifications of these two types: *e. g.*, the delay-action fuze has both a percussion and time arrangement, so as to burst the shell an instant after impact. All are delicate and apt to become hopelessly impaired with age or exposure to damp. In the American pneumatic dynamite-gun, the shell contains an electric battery, and the circuit is completed by the shell striking either water or the target.

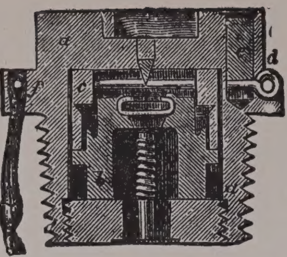


FIG. 2

G

G (*jē*), the seventh letter, is a vocal consonant. It represents two sounds: one simple, as in *gave*, the other compound, like that of *j*, as in *gin* The first is a guttural, its place being the soft palate and the back of the tongue. The simple sound is called hard *g*, the compound one soft *g*. Hard *g* occurs before *a*, *l*, *o*, *r*, *s* or *u* in the same syllable; at the end of a word; sometimes even before *e*, *i* or *y*. Examples: *gay*, *glad*, *go*, *grow*, *bags* and *gun*; *berg*; and *get*, *gig* and *muggy*. Soft *g* usually occurs before *e*, *i* or *y* and in *gaol*. Examples: *gem*, *engine* and *stingy*. *G* is silent before final *m* or *n*, as in *phlegm* and *sign*. So is initial *g* before *n*, as in *gnostic*. In some words from the French, *g* equals *z*, as *rouge*. *G's* name and shape, a modified *C*, come from Latin, probably through French.

Gabun. See FRENCH CONGO.

Gadsden Purchase, a name given to that part of New Mexico and Arizona which was purchased from Mexico by Gen. James Gadsden for the United States on Dec. 30, 1853. The sum of $10,000,000 was paid for the territory, which included an area of 45,535 square miles.

Gadski (*gădz'kē*), **Johanna**, German opera singer, born at Anclam, Prussia, 1871. After receiving a musical education at Stettin, she made her début in New York, taking the rôle of Brünhilde in Wagner's opera. She is popular as a singer in England, having sung at Worcester Festival and at Covent Garden. She was enthusiastically received in America during her concert tour in 1899–00 and her reputation has increased in later years. She is particularly successful in her rendering of Wagner.

JOHANNA GADSKI

Gage, Lyman Judson, American financier and secretary of the treasury in the McKinley administration, was born at De Ruyter, Madison County, N. Y., on June 28, 1836, and was educated at the academy, Rome, N. Y. For a time he had a junior post in an Oneida bank; but in 1855 he went to Chicago, where he became cashier in the Merchants' Loan and Trust Company, and in 1868, entering the service of the First National Bank, he rose to be president of the institution. During the Columbian Exposition he acted as president of the board of directors, and has since been president of the Chicago Bankers' Club, the American Bankers' Association and of the Civic Federation of Chicago. In March, 1897, he became secretary of the United States treasury, but resigned in 1902. He resides in New York.

LYMAN J. GAGE

Gaines Mill, Battle of, one of the famous seven days' battles of McClellan's Peninsular campaign. McClellan had crossed the Chickahominy with a part of his army leaving Gen. Fitz-John Porter with 35,000 men on the north bank. Here Porter was attacked on June 27, 1862, by the Confederate army, 55,000 strong, under Generals Lee and Stonewall Jackson. After hard fighting all day, the Federals were driven back, and the advantage rested with the Confederates, though the result was not decisive. Porter's loss was nearly 7,000 in killed, wounded and prisoners. The locality is about eight miles northeast of Richmond, Va.

Gainesville, Texas, city and county-seat of Cooke County, sixty-five miles north of Fort Worth. It is important as the center of a stock-raising and agricultural region. Its industries include pressed-brick works, carriage and leather-factories, cotton seed-oil and flour-mills, soap-factories and meat-packing establishments. The city has good schools, several churches and the service of two railroads. Population 9,500.

Gainsborough, Thomas, a noted English landscape-painter, was born in Suffolk, in 1727. When fourteen, he was sent to London to study art. He first established himself in Ipswich, later at Bath and finally at London. He was one of the foundation-members of the Royal Academy in 1768. He died on Aug. 2, 1788. As a portrait-painter he was the only worthy rival of the great Reynolds. In landscape-painting he reached a high rank. See Brock-Arnold's *Gainsborough and Constable.*

Galahad, Sir, in the Arthurian romances, the noblest and purest knight of the Round Table. He was the son of Sir Launcelot of King Arthur's court by marriage with Elaine, the fair daughter of King Pelles, and achieved the honor of winning the Holy Grail, in the quest of which his father and the other knights had failed. The meaning is that Sir Galahad, according to the legend, had been permitted by his sanctity to see the Holy Grail (Sangraal); that is, that he saw not by the eye of faith merely but with his bodily eyes, and touched with his hands the incarnate Savior, reproduced by the consecration of the elements of bread and wine. He therefore takes the "seat perilous" at the banquet of King Arthur and his knights, and becomes king of the Holy City. See Malory's romance of *Morte d' Arthur* and Tennyson's lyric of *Sir Galahad*, his *Elaine* and the *Holy Grail* in the *Idylls of the King.*

Galen (*gā'len*), **Claudius,** a celebrated Greek physician, was born at Pergamus, Mysia, in 130 A. D. He studied medicine at various places, and was physician to the school of gladiators in his native city for six years. He then went to Rome, where he gained a great reputation, attended the emperor Marcus Aurelieus and his two sons and, later, the emperor Severus. Of his works, eighty-three genuine treatises still exist. He gathered all the medical knowledge of his time, and fixed it on such a firm basis of truth that his work continued to be the authority in that science for centuries. He died, probably in Sicily, about 201 A. D.

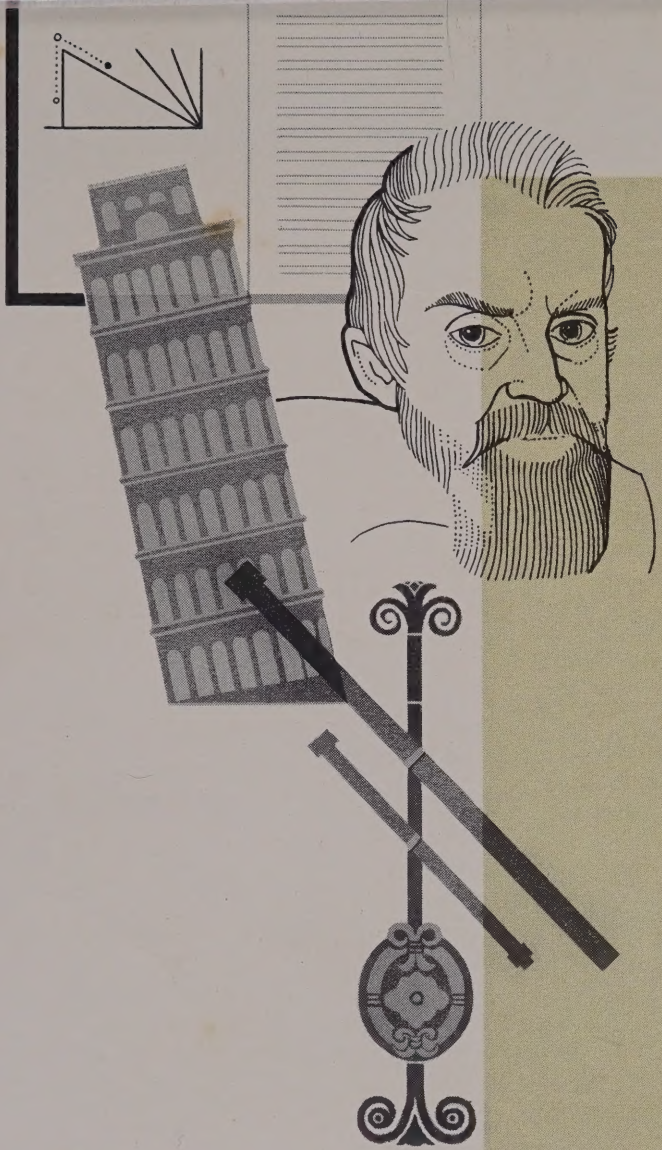
Galena, Ill., is the county-seat of Jo Daviess County. It was named from the galena, the most important of the lead-ores, found in its vicinity; settled in 1827; and incorporated as a city in 1839. About 1850 it became the western terminal of the first-built section of the present Chicago and Northwestern Railroad. It is also served by the Chicago, Burlington and Quincy Railway. The city, which owns its electric-light plant, has a large trade and is a center of great interests in lead and zinc. Among the other industries are shoemaking and smelting. Galena is famous for having been the home from which Grant entered service in the Civil War. The homestead still is one of Galena's attractions. Others comprise Grant Park, the statue of Grant, the federal customhouse, the government-building and the public library. Population 4,875.

Gale'na, Kan., a thriving city of Cherokee County, southeastern Kansas, on the Kansas City, Fort Scott and Memphis Railroad It is also reached by the St. Louis and San Francisco Railroad, and is seven miles west of Joplin, Mo. Mining is the chief industry of the region, which is rich in deposits of lead and zinc. The city added some eight thousand to its population in the previous decade, the number of its inhabitants now being 6,096, employment being given to many of them in the town's stamping and smelting works and other industrial activities.

Galesburg, Ill., the capital of Knox County, on four branches of the Chicago, Burlington and Quincy Railroad, also has the service of the Santa Fe, and is 162 miles southwest of Chicago. It is in a rich agricultural region, and near by are also some remunerative coal-mines. It possesses some notable educational institutions, among them Knox College (Congregational, Lombard University (Universalist), etc. It has considerable industries, including machine-shops, foundries, carriage and wagon-works, stockyards and the largest paving-brick manufacturing plant in the world. Population, 24,500.

Gal'ilee, one of the four Roman divisions of Palestine. In the time of Christ it included the whole northern portion of Palestine from the Mediterranean to the Jordan. The district was divided into Upper and Lower Galilee, the former being hilly and wooded and the latter level and fertile. At that time it was mainly inhabited by Syrians, Phœnicians, Arabs and Greeks, with a few Jews. It had, therefore, long been known as Galilee of the Gentiles, *i. e.*, of the nations. The principal towns were Tiberias and Sepphoris. Those that figure in the gospels are Cana, Capernaum, Nazareth and Nain. There are still in this region the ruins of many fine synagogues. Galilee now forms part of the division called the pashalic of Damascus, in the Turkish province of Syria. It still has a number of Jewish inhabitants. See Dr. S. Merrill's *Galilee in the Time of Christ.*

Galilee, Sea of, called also Lake of Gennesaret, Sea of Tiberias and Sea of Chinnereth. It is a lake in the northern part of Palestine, lying 626 feet below the sea, and is thirteen miles long by six broad and 820 feet deep. It occupies the bottom of a great basin, and is of volcanic origin. Its waters are cool, clear and sweet, although the red and turbid Jordan and many warm springs find their way into it. Its shores on the east and north are bare and rocky; on the west they slope gradually and are covered with vegetation. It has many sacred associations. On its banks are Bethsaida, Capernaum, Magdala and Tiberias. In the time of Christ the surrounding region was the most densely populated in Galilee; now even its fisheries are almost entirely neglected.



PHYSICIANS EMINENT IN OTHER FIELDS

Galileo Galilei (1564-1642)

ASTRONOMER, MATHEMATICIAN, PHILOSOPHER, STUDENT OF MEDICINE

"Eppure si muove!" (It does move, though)

These are the words sixty-nine year-old Galileo was supposed to have whispered as he knelt in humiliation before the Tribunal at Rome, when he was compelled "to abandon the false opinion that the sun was the center of the universe and immovable, and that the earth was not the center of the same, and that it moved." His undying contribution lay in the field of philosophy in which he showed that real knowledge comes through observation, experimentation and measurement. He put the telescope to the use of astronomy and by means of it showed the Milky Way to be a collection of lesser stars, observed the mountainous terrain and the libration of the moon, recognized solar spots, called attention to the phases of Venus, discovered the satellites of Jupiter, and pointed out a new star beyond the planets in the constellation Serpentarius. • The swinging of a lamp in the Cathedral at Pisa led to his discovery of the isochronism of the pendulum and to the timing of the human pulse. His famous experiment from the Leaning Tower of Pisa proved that bodies of different weights fall with the same velocities. He demonstrated the parabolic path taken by a projectile. He had the remarkable vision to anticipate the discovery of the force of gravitation, the existence of planets beyond Saturn, and the measurable velocity of light. Galileo studied medicine at the University of Pisa for three years but never put this knowledge to use. Blindness and illness overtook his last years.

BERNARDA BRYSON

Galile'o (*găl'ĭ-lē'ō*) (usual designation of Galileo Galilei), the founder of modern physics, was born at Pisa, Feb. 18, 1564, and died at Arcetri, near Florence, Jan. 8, 1642. In 1581, at the age of seventeen, he entered the University of Pisa where a brilliant career awaited him, not only in mathematics and mechanics but in literature, eloquence, music and art. From 1592 to 1610 he held a chair of mathematics in the University of Padua. The remainder of his life was mostly spent at Florence. It is easy to recall Galileo's position in time, if we remember that he was born on the day of Michelangelo's death and that he died in the year of Newton's birth.

In popular estimation Galileo has ranked as a great astronomical discoverer, and rightly so; but it is now clear that his chief service to science is the establishment of modern dynamics.

To him we owe a clear statement of the fundamental assumption of physical science, namely, that nature always behaves in the same way in the same circumstances.

To him we owe also the ideas which underlie the first two of Newton's laws of motion. See DYNAMICS.

He first enunciated the correct laws of falling bodies, showing that, if we neglect the resistance of the air, the path of a projectile must be an ellipse. In astronomy he did not invent the telescope, as is so often asserted; but he used this instrument with great skill to discover spots on the sun, measure its rotation-period, discover four of the satellites of Jupiter, observe the phases of Mercury and Venus and find the elongated form of Saturn which Huygens later showed to be due to the planet's rings.

But no astronomical service of Galileo can outrank that which he did in establishing the Copernican system by showing the mechanical principles upon which the solar system is constructed. In 1616 he was warned by the Inquisition not to "hold, teach or defend" the Copernican system, and agreed to act upon their advice. Nevertheless, in 1632, he published his *Dialogue Concerning the Two Great Systems of the Universe*, which proved to be a somewhat disguised yet powerful argument for the Copernican view. As a result he was summoned to Rome in Oct., 1632, where he disavowed his adherence to the heliocentric system. The story which is often told of his recanting and then remarking concerning the earth, as he rose from his knees: "It does move, however!" is a pure fiction of later times.

An English translation of the more important of Galileo's writings is sadly needed.

Gallatin (*găl'lȧ-tĭn*), **Albert,** an American statesman, was born at Geneva, Switzerland, Jan. 20, 1761. He studied in its university, and in 1780 emigrated to America. He served a short time in the Continental army, and taught French for a year at Harvard College. He settled in Pennsylvania, and was naturalized in 1786. He soon entered politics. When the "whiskey insurrection" broke out, Gallatin, at considerable personal risk, helped to bring it to a peaceful close. From 1795 to 1801 he was a member of the house of representatives, and was a recognized leader in his party. He directed his attention especially to financial questions, and under Jefferson and Madison was secretary of the treasury, where his successful management and his writings made him recognized as one of the first financiers of the age. He also took an important part in the negotiations for peace with England in 1814, and signed the treaty of Ghent. He served as minister to France and to England together with other important posts. The latter part of his life was devoted to literature. He made a study of the American Indians, and wrote several works on the subject. He died at Astoria, N. Y., Aug. 12, 1849. See *Life* by Henry Adams.

Galley, a long, narrow rowboat, carrying a sail or two, but depending for safety and movement upon oars. When small, galleys were called galleots and brigantines. An old-time galley was about 150 feet long, and its greatest beam was 20 feet wide. It carried two masts, a mainmast and a foremast, each with a great lateen-sail. There were a short deck at the prow and one at the stern. Between the two were sometimes 54 banks or benches, 27 on a side, occupied on either side by four or five slaves, whose duty was to propel the vessel by means of oars. If a Christian vessel, the rowers were either Turkish or Moorish captives or Christian convicts; if a Barbary corsair, the rowers were Christian prisoners. Sometimes a galley-slave worked as long as twenty years, sometimes all his life, at this onerous calling. Slaves were chained so close together on their narrow bench that they could not sleep at full length. Biscuit was made to last six or eight months, each slave getting 28 ounces three times a week and a spoonful of some mess of bones, rice or green stuff. Between the two lines of rowers ran the bridge, and on it stood two boatswains, armed with long whips with which they scourged the slaves. On a large galley, besides 270 rowers, there was a mixed crew of about 75 men, together with 50 or 60 soldiers; so that the whole equipment of a fighting-galley must have reached about 400 men. A galleas originally was a large, heavy galley, but later it became a sailing ship, as was the galleon of the Spaniards. See S. Lane-Poole's *The Barbary Corsairs.*

Galls, deformities produced on plants by insects, fungi and slime-moulds. One species of insect attacks the root, another leaf flower or stem. Of insects that cause galls may be mentioned gall-flies, certain caterpillars, a few beetles, certain mites and scale-insects. Eggs are laid in the tissues of the growing plant, and generally the galls appear to form after the egg hatches

Galsworthy, John, one of the foremost English dramatists and novelists of the 20th century, born in 1867. Among his many novels are *Villa Rubein* and *A Man of Devon,* two early works which received little attention; *The Island Pharisees,* a study of English life; *A Man of Property* and *Fraternity,* both concerned with economic and social questions. Among his plays are *Joy, Strife, The Silver Box,* and *Justice.* Though protesting against injustice, Galsworthy does not sacrifice artistic workmanship to propaganda.

Galt, Sir Alexander T., was born at Chelsea, England in 1817, educated in England, came to Canada and settled in Montreal. A government director of the Grand Trunk Railway in 1857–8, he proposed resolutions in the Canadian Parliament in favor of a federal union of British North America colonies in 1858. These resolutions became the basis of the policy of the government which he joined that year under Sir George E. Cartier. With Sir George E. Cartier and the Hon. John Ross he went as a delegate to England to urge the imperial government to sanction federation and the construction of the Intercolonial Railway; was minister of finance from 1858 to 1862, and a second time from 1864 to 1866. He was a delegate to Washington respecting the renewal of the reciprocity treaty, 1866–7, and was a member of the fisheries commission appointed under the treaty of Washington which sat at Halifax in 1877. He conducted negotiations on behalf of Canada for a commercial treaty with France and Spain, 1879, and was High Commissioner for Canada in England, 1880 to 1883. Until his death in 1893 he then lived in retirement.

Gal′ton, Francis, an eminent English scientist, was born near Birmingham in 1822. He graduated from Trinity College, Cambridge, in 1844. He travelled in 1846–1847 in the Sudan, and in 1850 entered upon a thorough exploration of part of the southwest of Africa. On his return to England Galton published the narrative of his explorations. He next turned his attention to meteorology; and to him are due both the theory of cyclones and anticyclones and the device of weather-maps. Galton is greatest as a student of human heredity. In his *English Men of Science, Hereditary Genius, Inquiries into Human Faculties, History of Twins* etc. he made studies, some of them quantitative, which led him to set the greatest emphasis upon heredity and to attribute less importance to ordinary differences in nurture than was previously done. He also published two papers on finger-prints. Galton has made the methods of statistics popular among modern scientific students. He died in 1911.

Galuppi (*gȧ-lo͝op′pē*), **Baldas** (1706–1784). Italian composer of operas and harpsichord-music; chapel-master at St. Mark's, Venice, and director of the Incurabili, one of the four renowned conservatories of Venice. Robert Browning has introduced him in his poem, *A Toccata of Galuppi's.*

Galvani (*gȧl-vä′nē*), **Luigi,** an Italian surgeon, distinguished especially for his electrical discoveries He was born at Bologna on Sept. 9. 1737, and died on Dec 4, 1798. From 1775 he was professor of anatomy in Bologna In 1780 he observed that frogs' legs, when skinned and supported on hooks of two different metals in contact, begin to twitch. He recognized in this the electrical effect of a battery composed of two metals and the moist frogs' legs. In 1786 he studied the effect of atmospheric electricity in stimulating the nerves of the frog's leg. The frog's leg. thus used, is indeed the earliest galvanometer of which we have any account.

Gal′vanom′eter, an electrical instrument employed to detect the presence of an electrical current and sometimes to measure the intensity of the current. More than nine tenths of all the galvanometers in use depend upon the fact that a conductor conveying an electric current is surrounded by a magnetic field. (See ELECTRICITY.) Up to the last quarter of the 19th century currents were very frequently measured by their electrolytic effects and sometimes by their heating effects. Edison has devised a commercial current-meter which measures the current by measuring the amount of zinc which the current will remove from one zinc-electrode and deposit on another. Major Garden has invented a galvanometer for measuring electromotive forces, which depends upon the fact that the larger the current the hotter and longer the conductor. But these two instruments are not widely used. Galvanometers of the magnetic type are of two different kinds. In one the conductor is bent into a circular coil of wire, in the middle of which is suspended a small magnet. The magnet, when not acted upon by any moment of force, will set itself in the plane of the earth's magnetic meridian or in the direction of any artificial field which may be placed about it. If a current be passed through the coil of wire which has been placed in the plane of the magnetic field, the magnetic field will be changed and the suspended magnet will turn on its axis, thus indicating the presence of the current. This form of instrument has been brought to great perfection through the efforts of Lord Kelvin and later, of

Dr. F. Paschen of Germany. The other kind of galvanometer, which depends also upon the magnetic effect of the current, is one in which the magnet is fixed and the conductor so suspended as to rotate between the poles of the magnet. The position of equilibrium of the coil is such as to include no lines of force. When a current passes, the coil sets itself so as to include the greatest possible number of lines of magnetic force and thus indicates the presence of the current. This type of instrument was perfected by Kelvin and by D'Arsonval. It is generally known as the D'Arsonval galvanometer.

Very perfect galvanometers of this type, so graded as to read the current directly in ampères, are made by Weston of Newark, N. J.

Sometimes a combination of these two kinds is employed. Instead of a suspended magnet a suspended coil is employed, while the magnetic field in which this coil swings is produced by the current which is to be measured. In other words, a movable coil is suspended in the field of a fixed coil. This tpye of instrument was invented by Weber, and used to be called an electro-dynamo meter, but has been brought to a high degree of perfection by Kelvin in his ampère-balance.

A galvanometer, which has in it a resistance which is high compared with other parts of the circuit is called a voltmeter, because its readings are proportional to the voltage between the terminals of the circuit to which it is applied.

Gal'veston, in southeastern Texas has an interest and importance exceeding that of any other city of the same size in the United States. Its special claim to distinction lies in the energy of its citizens in wresting prosperity out of unparalleled disaster and, at the same time, initiating the business-corporation form of municipal government known widely as the Galveston plan. The situation of the city on Galveston Bay, which is 35 by 15 miles, gives it the best natural harbor on the Gulf of Mexico and makes of it a seaport second only to New Orleans. Its further growth must keep pace with the development of the great southwest. It had the disadvantage of lying on an island which, although 30 miles long by three wide, rose but a few feet above the level of the Gulf and was occasionally flooded. Proper paving and drainage were impossible. Lying in the same latitude as St. Augustine, Florida, its climate is subtropical. Groves of oleander and orange gave it beauty; but cholera and yellow fever were accepted as inevitable, as was corruption in the municipal government. It was a wide-open, slatternly, unhealthy town, but no one thought of changing anything, for business flourished with the enormous shipments of cotton, wheat, lumber, tallow and hides, and life, if precarious, was easy and luxurious.

On the 8th of September, 1900, the city was almost destroyed by a cyclone and tidal wave. One sixth of the population was drowned and one third of the property destroyed. The rotten cedar-block pavements floated off in rafts, laying bare the original sand. The treasury was empty, credit was gone, taxes could not be assessed on property that had ceased to exist. Thousands were fleeing the stricken city and, in the hour of extremity, the municipal government broke down. But that ill-wind had blown away indifference, greed and moral miasma. Out of the disaster sprang such energy, ability and civic patriotism as the world has rarely witnessed. The work to be done needed new, clean tools. The city was looked upon as a ruined business, and a business-corporation government was devised to build it up again.

A special act of the legislature abolished the mayor and council and created a board of directors or commissioners of five members, one of whom is president, all being elected by popular vote. Salaries were nominal, for the commissioners were simply the responsible heads of departments with well-paid, expert managers under them to carry out the details. The same kind of men of independent means, position and reputation were secured as now serve for nothing on library, park and school boards in other cities. One commissioner was at the head of finance and revenue—a banker with an expert accountant, employed as city auditor, under him; one had charge of water-works and sewage, with a civil engineer; one of fire and police; and one of streets and public property.

A new city occupies the old site. Galveston has built a sea-wall four and a half miles long and seventeen feet high, and raised the grade of the city to its top. It has paved the business-section with brick and installed a sewerage system; drained the swamps; stamped out epidemics; and cleaned the town morally. In spite of this monumental work municipal expenses have been cut one third. The credit of the city is above par. The population, now over 50,000, has been more than restored, and the business has increased. The commission system has proved such an important contribution to the science of government that it has been adopted by many other cities.

Gama (*gä'mä*), **Vasco da**, the greatest of Portuguese navigators, was born about 1469 at Sines, a small seaport in the province of Alemtejo. He early distinguished himself as a brave mariner. When the voyage of Diaz around the Cape of Good

Hope caused the Portuguese to determine on further explorations, Gama was chosen to command an expedition of four vessels, manned with 160 men. Furnished with letters to all the potentates he was likely to meet, among them the fabled Prester John, then supposed to be reigning in splendor somewhere in the east of Africa, he set sail on July 8, 1497, from Lisbon. Vexed by storms, he was four months in reaching St. Helena Bay, and after rounding the Cape, in the midst of storms without and mutinies among his crew, he made Melinda early in the following year. Here, finding a skillful Indian pilot, he steered eastward across the Indian Ocean and arrived at Calicut, India on May 20, 1498. The ruler of Calicut, at first suspicious, soon became hostile, and Gama had to fight his way out of the harbor. He reached Lisbon in September, 1499, was received with great distinction, and created a noble. Three years later Gama was sent to avenge the massacre of a Portuguese colony at Calicut. He bombarded Calicut, destroyed a fleet of 29 ships, extorted a favorable peace, and founded the colonies of Mozambique and Sofala; but the cruelties inflicted in this expedition left an indelible stain upon his name. After 20 years of retirement at Evora, Gama was again sent to the scene of his triumphs, as viceroy of the Portuguese dominions in India; and, while engaged there in successful work, he died at Cochin in December, 1524. His body was taken to Portugal and buried with great pomp. The great achievement of Gama is probably only second in importance to the voyage of Columbus a few years before. His story gave rise to the *Lusiad* of Camoens. See *The Three Voyages of Vasco da Gama*, translated by Lord Stanley of Alderley.

Gambetta (*găm-bĕt'tȧ*), **Leon Michel,** a French statesman, was born at Cahors, Oct. 30, 1838. He became a lawyer at Paris, and soon attracted attention. Upon the surrender of Napoleon III at Sedan in 1870, Gambetta proposed to dissolve the empire, and he was one of the first to proclaim the republic on Sept. 4. When the government of national defense was formed, he became minister of the interior, and at once took active measures for opposing the Germans and defending Paris. He escaped from the city in a balloon, and took the general conduct of public affairs, being for five months dictator of France. With marvelous energy and undaunted courage, he called into existence army after army and sent them against the German hosts; but in vain. He continued the contest even after Paris had surrendered, and refused to agree with the action of his colleagues in the capital. He finally resigned, and retired for a short time to Spain, but be became more popular than ever with the masses, and was elected to the national assembly by the different departments. After the fall of the short-lived commune Gambetta became the most prominent Frenchman of his time, and played an important part in firmly establishing the republic. Though the most powerful statesman in France, he refused for some time to take office, but later he became president of the chamber and, in November, 1880, premier. He resigned in 1882 after the rejection of his plan for the revision of the constitution, and afterward took little part in public affairs. On Nov. 26 of that year, as he was handling a revolver, it accidentally went off, inflicting a slight wound in the hand, from which, however, he died on Dec. 31, being only 44 years old.

LÉON GAMBETTA

Gam'bia, a river of western Africa, the more southerly of the two great streams of Senegambia. It enters the Atlantic after a course estimated at over 1,400 miles, by an estuary which in some parts measures nearly 27 miles, but contracts at the mouth to little more than two miles. From June to November it is navigable for vessels for about 400 miles. The lower part of the river overflows its banks in the rainy season, and like the Nile leaves a fertile coating of mud.

Gambia, a British colony and protectorate in West Africa on the river of the same name, is situated between Senegal and French Guinea. Area, independent of the adjacent protected territories, 4 square miles; population 13,456. The colony and protectorate have an area of 3,061 square miles and a population of 163,718. The whole colony, with the exception of the island of St. Mary (area 4 square miles, population 8,807), is conducted on the protectorate system. Bathurst is the capital of the island of St. Mary; population 6,000. There are no local telegraphs or railways, but there is a short telephone line at Bathurst, a tramway is in contemplation, and there are cable lines from Bathurst to St. Vincent and Sierra Leone. There are six elementary schools (with over 1,000 pupils), government-aided, besides the Wesleyans' technical school and secondary school. The chief exports are ground nuts, beeswax, hides, rice, millet, sweet potatoes, cotton and rubber.

Games. Modern psychologists have come to regard play as one of the most important activities. The Puritanic notion that the play-spirit is something to be crushed out and even the ordinary view that games may be tolerated only when not positively injurious to body or morals and when kept within proper limits of time and expense have given place to the belief that here we find an indispensable human occupation. Play is by many regarded as synonymous with rest or recreation, and as quite as important as sleep to relieve the fatigue caused by close application to one task. This view doubtless is correct, and it constitutes an important guide to practice.

A second theory is that advanced by the poet, Schiller, and the philosopher, Herbert Spencer. According to them, play is an activity by which the surplus energy of the body is dissipated. We play because we have energy that must be used, and if work does not consume it, play is inevitable. This theory also is part of the truth about play. It does not, however, account for the fact that children play when they are tired or sick.

A third theory, that of the German philosopher, Professor Gross, seems the most complete and significant of all. According to it, play is simply the manifestation of instinctive activities on occasions when something stimulates them, although, owing to the immaturity of the players or the character of the situations, no serious immediate result is possible or desirable. This theory accounts for the form of animal play, for it is that of the instincts of the species. The puppy plays at fighting, at pursuing its prey or fleeing from its enemies. The kid leaps as if on a mountain-side, and the colt flees as from a pursuer and kicks. The practice that the animal gets through these activities matures and perfects its instincts. Play, therefore, is its method of development, its education.

With human beings it is not quite so evident that play is the manifestation of instincts. For the instincts of the child, although very numerous, also are very imperfect, *i. e.*, they require much training and experience in order to be developed to efficiency. Hence, before they are cultivated, they apparently are so useless that one would hardly recognize them as instincts at all. The hereditary element in the child's activity is very early modified by imitation and other forms of external control. Nevertheless, it is of the utmost importance, for without the instinctive tendencies there could be no development. They, in fact, constitute the powers or capacities of the child, and they reveal those interests (*q.v.*) in the direction of which all learning must proceed. During the first four or five years of a child's life the larger part of its learning comes through its play. Very early this takes the form of games largely adopted from other children, but each excellent, in that it affords a fine opportunity for the utilization and control of the instincts: fear, anger, sociability, shyness, affection, jealousy and envy, rivalry, sympathy, constructiveness, secretiveness, acquisitiveness, fondness for organization and government, for rhythm and beauty and for expression.

The play of children begins with mere impulsive activity; wiggling, grasping and handling things, throwing them about, climbing, running etc. Through this the child gains control of its body and becomes familiar with the simpler properties of common things. This knowledge and power are enlarged by the destructive and constructive sport that begins to interest children after the first year. Later, control is perfected under the influence of rivalry, when the play activity takes the form of the performance of physical or, perhaps, mental feats. In all these sports, with the possible exception of the last, the child does not need the active co-operation of others. The games in which such co-operation is necessary are especially numerous and important in the development of the child. Springing from fellowship in any pleasant activity like running, throwing balls or peek-a-boo, they expand into games involving organization or rhythm or both. Here we find the ring-games, the forms of which number hundreds, perhaps thousands. They usually make use of rhythmical movement and often verse or song. With very young children their interest is almost entirely that of activity, novelty, rhythm, harmony and social intercourse. Later, they involve some competition, especially in the form of seeking the favor of other children or older persons. With children of ter these simpler interests have developed into the fiercer joys of intense rivalry. The games become contests, where individuals or sides struggle for supremacy in strength, speed, skill or cunning. Of these the most important and elaborate are the various kinds of ball.

With man the social training afforded by the game may be said to overshadow that in bodily control and in knowledge. Through this activity the child learns the fine art of getting on with his fellows, how to co-operate, how to influence, how to lead, when to submit, when to seek help, when to resist, when to command, manners, customs, morals. In a word. the game socializes the child, and, since it is through social co-operation that man lives. this activity is a fundamentally important one educationally. With primitive races the festival, with its games, has been the principal agency for social intercourse on a large scale. Games were used to celebrate and cement alliances. They were early associated with religious observances, both having the same social and ethical function. From them sprang choral song, tragedy and comedy. Indeed, Schiller regarded the art-impulse as essentially the outgrowth of the tendency to play. Especially with social peoples like the Greeks has the game been allowed a great part in the life both of adult and child. With them it was the principal form of education.

The growth of a mass of learning which it was felt necessary to teach the young involved the substitution of the confinement and restraint of hard work for the freedom and spontaneity of play. This change in educational method was promoted by Christianity, which substituted the ideals of individual salvation and otherworldliness for that of racial and national prosperity and happiness. Asceticism despised the game as pleasant, and glorified the life of the hermit. In modern times the game has again received recognition as a most valuable educational agency, because of the emphasis thrown on the importance of interest (*q.v.*) and the fact that play affords the teacher a chance to introduce a living motive for learning what the school has to teach (see TEACHING, METHOD OF). Basedow (1723-1790) and Froebel (1782-1832) among educational reformers may be said to have done most to resurrect the game and give it a place in education. The latter was, of course, interested most in little children, but modern educators see that the use of the game in the school-room need not be confined to them. Indeed, reformers like Professor Dewey suggest that the life of the school may best take the form of social or group-activity in what may properly be called games. From this problems may be caused to spring, the solution of which may involve all the learning that the school desires to give. Reading, writing, arithmetic, science, history etc. as well as music, art and physical culture may thus be learned through the game. Even though not all school-life may be thus organized, it is recognized that the game may occasionally offer a very effective means of instruction. Finally, educators now realize the great importance of supervision of the play-ground sports of children (see PLAYGROUNDS). For, while the game is the greatest school of social aptitude, it may corrupt as well as build up character. Children need to be taught how to play as well as how to work. Such instruction to be effective must, however, be given in so tactful a way as not to destroy the spontaneity of the game. See CHILD STUDY, INTEREST, METHOD OF TEACHING, PLAYGROUNDS. Consult Gross: *The Play of Animals* and *The Play of Man*, published by Appleton & Co. E. N. HENDERSON.

Gametangium (*găm'ê-tăn' jĭ-ŭm*) (in plants) the organ in which the gametes or sexual cells are formed. Usually, it is applied only in case the gametes are alike in appearance and cannot be distinguished as male and female. In reality, however, the antheridium, oögonium and archegonium are all gametangia. See GAMETES.

Gamet'es, the sexual cells of plants, which fuse in pairs to form the oöspores or fertilized eggs. In the lower plants gametes are alike in size and activity, but in higher plants they become unlike. One kind remains small, usually has cilia, can swim actively and is known as the male cell or sperm (spermatozoid, antherozoid). The other kind becomes relatively very large, has no cilia and remains motionless, and is known as the female cell or egg (oösphere).

Gametophyte (*găm'ê-tō-fīt'*) (in plants), in alternation of generations (which see), the phase of the plant or generation which bears the sex-organs, that is, produces the gametes. In the mosses the gametophyte is the leafy plant, the most conspicuous part; in the ferns it is a very small, prostrate, heart-shaped body which is not usually seen; while in the flowering plants it is concealed from ordinary observation, although the endosperm of most seeds is part of a female gametophyte, that is, a gametophyte which produces the egg.

Gam'opet'alous Flowers, those in which the petals are more or less coalescent. Now mostly replaced by the word sympetalous, which see.

Gando (*găn'dō*) in western Sudan once an independent sultanate but now partly a British and partly a French possession, is on the upper Niger near the Sahara. It is inhabited chiefly by the Fulah, and is an exceedingly fertile region, the rainfall being abundant. The population is estimated at 5,000,000, and their religion is Mohammedanism.

Ganges (*găn'jēz*), the great river of northern India, rises in Gahrwal, on the southern slope of the Himalaya Mountains, issuing under the name of the Bhagirathi from an ice-cave 13,800 feet above the level of the sea. Its general course is southeasterly. At Allahabad it is joined by the Jumna, and farther down by the Son, Gandak and Kusi. At a distance of 220 miles in a straight line from the Bay of Bengal it begins to throw out the branches which inclose the level delta. The main channel, called the Padma or Padda, joins the Brahmaputra, and between this, the most easterly, and the Hugli, the most westerly mouth, lies the delta, with a multitude of mouths and channels. The

Ganges has a total length of 1,157 miles; its drainage-basin embraces over 390,000 square miles, lying between the Himalaya and Vindhya ranges and extending east to the mountains which separate Burma from Bengal. It in some sense is navigable from the point where it enters the lowlands to its mouth; its stream never fails in the hottest summer, and its floods distribute over the fields a rich top-dressing of soil. The Ganges is the most sacred river of India; from its source down to the sea every foot of Mother Ganges' course is holy. To bathe in her waters, according to the Brahman creed, will wash away sin; to die and be buried on her banks secures free entry to eternal bliss. Gangotri, Hardwar, Allahabad, Benares and Sugar Island, the most sacred spots, are visited by thousands of pilgrims every year. So potent is the religious influence of this stream that those who exclaim "Ganga, Ganga," even at a distance of a hundred leagues, atone for the sins committed during three previous lives.

Ganymede (*gan'i-mēd*), the cupbearer of Zeus, was, according to Homer, the son of King Tros. The most beautiful of mortals, he attracted the notice of the king of the gods, who determined to make him his cup bearer, to succeed Hebe, and so sent his eagle to carry him off to heaven. Zeus gave Tros a pair of divine horses to make up for his loss, and comforted him by telling him that Ganymede was now immortal. Ganymede was later believed to be the same god that presided over the Nile. The Greeks placed him among the stars, under the name of Aquarius or the water-bearer. Ganymede was a favorite subject of ancient art, and to some extent is a favorite also of modern art.

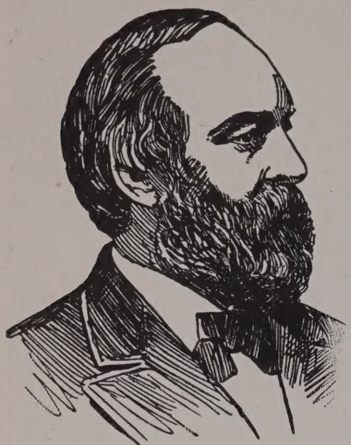
Gapon, George, a Russian socialist and priest, was born in Biliki, Poltava, in southern Russia. As a boy he lived with his peasant.parents, tending the sheep and cattle. At the age of twelve, he entered the lower Ecclesiastical School in Poltava. There he commenced to be influenced by the writings of Tolstoi. At sixteen he passed into the Ecclesiastical Seminary. For a few years following he taught in Poltava and there became ordained to the priesthood. Two years later he entered the Ecclesiastical Academy in St. Petersburg. About 1904 he formed a society called The Gathering of Russian Factory Hands of St. Petersburg. This was gradually enlarged, until it became a powerful band of socialists. Father Gapon led the Russians in their appeal to the czar in 1905, when he was shot. He was found hanged in April, 1906, in a country-home of Mme. Zverzhinskaia, in Oxorkow, Russia.

Garcia (*gär-thē'ä* or *gär-sē'ȧ*), **Calixto,** a Cuban insurgent-general, was born at Holguin, Cuba, Oct. 14, 1836, and died at Washington, D. C., Dec. 11, 1898. When the Ten Years' War broke out in 1868 under Céspedes, he joined the insurgents and rose to the rank of major-general. In 1873 he and his command were surprised by the Spanish forces and captured. Rather than surrender, Garcia placed the muzzle of his revolver beneath his chin and fired his last shot. The bullet came out between his eyes, but, though it marked him for life, did not kill him. After a long imprisonment in Spain he was pardoned and released, returning secretly to Cuba in September, 1895, when the new revolt occurred. In Cuba he coöperated with Gomez in the department of the East, and during the siege of Santiago by the United States forces he coöperated with General Shafter. In December, 1898, he was appointed head of a commission elected by the Cuban Assembly to visit Washington and confer with the United States authorities as to the future of Cuba. While at Washington, he died of an attack of pneumonia.

Gard'iner, Samuel Rawson, a modern English historian, was born in Hampshire, England, March 4, 1829. He was educated at Winchester and at Christ Church, Oxford, and for some years was professor of modern history at King's College, London. In 1885 he resigned his post to devote himself to writing. He has made a thorough study of the period of the first two Stuart kings in English history, and is the authority for that period. Besides his history of that period, he has also written a number of shorter works, among them *The Thirty Years' War* and *Introduction to the Study of English History.* His more ambitious works are *The Personal Government of Charles I; The Fall of the Monarchy of Charles I; History of the Great Civil War;* and *Constitutional Documents of the Puritan Revolution.*

Gard'ner, a town in Worcester County, Mass., 25 miles north of Worcester. It is the center of a large agricultural region, but is most important for its immense chair-factory. This establishment employs about 3,000 people, and manufactures almost every kind of chair. The town has two parks, a public library, an almshouse, a home for the aged, and a public bathhouse and swimming-pool costing $100,000. It is served by two branches of the Boston & Maine railway. Population, 16,163.

Gar'field, James Abram, the twentieth president of the United States, was born at Orange, Cuyahoga County, O., Nov. 19, 1831. His father died soon after his birth, and his early life was spent in poverty. He worked on a farm, and for three months was a canal boatman. He attended and taught in the public schools, studied at Hiram College, and finally graduated at Williams College in 1856 with high honors. The next year he became president of Hiram College, and at the same time preached and studied law. He was elected to the state senate in 1859, and on the outbreak of the Civil War he became colonel of the 42d Ohio volunteers. For gallantry he was made brigadier-general, being the youngest of that rank in the service. He served at Shiloh and at Corinth, and in Alabama was appointed chief of staff of the Army of the Cumberland, and, again for gallantry at the battle of Chickamauga, was made a major-general of volunteers. He resigned shortly after to enter Congress, at thirty-two, where he remained until 1880, being, after the removal of Mr. Blaine to the senate in 1876, the recognized leader of the Republican side of the house. In 1880 he was elected a United States senator, nominated for the presidency at Chicago, and elected by the votes of nearly all the northern states. On July 2, 1881, four months after his inauguration, he was shot in the depot of the Baltimore and Ohio Railroad in Washington, by Charles Guiteau, a disappointed office-seeker. For months he lingered between life and death, and at last died on Sept. 19, 1881, at Elberon, N. J., where he had been taken in the hope of saving his life. Funeral services were held over his remains in the rotunda of the capitol, and he was buried at Cleveland, O. See *Life* by J. R. Gilmore.

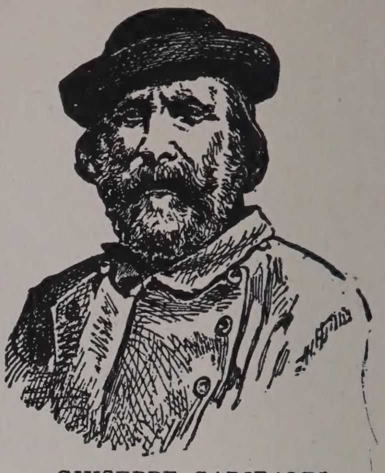


JAMES A. GARFIELD

Garfield, James Rudolph, born in Ohio in 1865, is a son of President Garfield. He studied law at Columbia, after graduating from Williams College. In 1896 he became a Republican member of the senate of Ohio. From 1903 to 1907 he was commissioner of corporations in the Department of Commerce and Labor, discharging the trying duties of this office with great ability. In 1907-09 he was Secretary of the Interior.

Garibaldi (*găr'ĭ-bal'dĭ*), **Giuseppe, an** Italian patriot, was born at Nice, July 4, 1807. Beginning his career as a sailor, his voyages filled him with that democratic ardor which marked his whole life. In 1834 he was concerned in the Young Italy movement of Mazzini, and was condemned to death, but escaped and went to South America. Here he assisted the province of Rio Grande in its rebellion against the emperor of Brazil, distinguished himself as a guerrilla and privateer, and married a beautiful creole who became the companion of his early campaigns. After various adventures he entered the service of the Montevideans.

In 1848 he returned to his native country, and entered with ardor into the struggle for Italian independence. He won fresh laurels as a leader, but in the following year was compelled to leave Italy. He came to the United States, where he remained till 1854. He then once more sought Italy, and in 1859 the outbreak of the war of Italian liberation called him again to arms. He placed his sword at the disposal of Victor Emanuel, and though much hampered by conflicting parties, he and his Red Shirts, as his men were called, won many victories. He freed Naples and Sicily from the Bourbons and turned them over to Victor Emanuel. But in an attack on Rome he was wounded and captured. Soon after he made a journey to England, on behalf of Denmark, and was received with the wildest enthusiasm. In the Austro-Prussian War of 1866 he once more figured, and in another attack on Rome was captured, but escaped in a boat to Caprera, his island home. He came to the assistance of the French republic in its struggle with Germany, and was elected to the national French assembly.



GIUSEPPE GARIBALDI

During the latter part of his life he remained a helpless invalid at Caprera, except when he came forth to take his seat in the chamber of deputies at Rome. He died on June 2, 1882. Though Garibaldi made many mistakes, his patriotism is undoubted, and he will always remain a central figure in the story of Italian independence. See J. T. Brent's *Life of Garibaldi.*

Gar'land, Hamlin, American novelist and short-story writer, was born at West Salem in the La Crosse valley, Wis., Sept. 16, 1861, and was educated in Iowa and in Boston, Mass. Until 1881 he worked on his father's farm, spent some time in Dakota, then proceeded east, where he taught English literature in private schools in Boston and its neighborhood, and published his first book in 1890. Since then he has devoted himself to lecturing and writing. Besides a collection of verse, entitled *Prairie Songs,* he has published *Rose of Dutcher's Coolly; A Member of the Third House;*

Main Traveled Roads; Wayside Courtships; Prairie Folks; Ulysses Grant: His Life and Character; The Trial of the Gold-Seekers; and *Boy-Life on the Prairie.*

Garnet, a mineral found distributed in crystals through many crystalline rocks. The commonest form are crystals of 12 or 24 sides, and the commonest color is some shade of red, but brown, yellow, green and black varieties are known. All garnets contain much silica; in fact, they are silicates; the others' constituents vary, and they are divided into a number of groups, according to what they contain. Among the best-known kinds are alumina-lime garnets, alumina-iron garnets, lime-iron garnets, etc. They also have popular names, as cinnamon-store, oriental garnet, common garnet. The garnets of commerce are brought from Bohemia, Ceylon, Peru and Brazil; and the most esteemed kinds are commonly called Syrian garnets. The stones vary in size from the smallest that can be worked to the size of a hazelnut. Larger ones usually have flaws or impurities.

Garonne (*gȧ′rōn′*), the principal river in the southwest of France, rises within the Spanish frontier in the Pyrenees, 6,142 feet above the sea. Flowing in a general northwesterly direction, it is joined by several tributaries, and widening into the estuary which bears the name of the Gironde, about 50 miles long, enters the Atlantic at Pointe de Grave. The total length is about 346 miles, and it drains an area of some 22,020 square miles. Ocean-steamers go up the river as far as Bordeaux and small craft as far as Cazeres. At Toulouse it is joined by the Central Canal, which, running eastward to the Mediterranean, forms with the Garonne a means of communication between that sea and the Atlantic. The valley of the Garonne is noted for its beauty.

Gar′rick, David, a celebrated British actor and dramatist, was born at Hereford, England, Feb. 20, 1717. He studied for a few months under Samuel Johnson, and in 1737 master and pupil set out for London. After some preparation Garrick made his appearance as an actor in 1741. At first he played minor parts, but his success as Richard III was so great that the other theaters were deserted. In 1747 he became manager of Drury Lane theater, which he continued to direct till 1776, when he retired from the stage. During this period Garrick was the great attraction and played continually, his only rest being a trip to the Continent. He died on Jan. 20, 1779, and was buried in Westminster Abbey. As an actor Garrick occupies the first rank. He found the stage given over to formality and tradition, and in their place he left the impress of his own naturalness. He was equally at home in tragedy, comedy and farce. His dramatic productions are of little value. See Percy Fitzgerald's *Life of Garrick.*

WM. L. GARRISON

Gar′rison, William Lloyd, an American journalist and abolitionist, was born at Newburyport, Mass., Dec. 10, 1805. After trying shoemaking and cabinet-making, he became a printer on the Newburyport *Herald*, and when only 16 began to write for the newspapers, trying to arouse an interest in the slavery-question. In 1824 he became editor of the *Herald* and accepted some of Whittier's earliest poems, when their author was yet unknown to fame. Later he became editor of the *Genius of Universal Emancipation* at Baltimore, and was imprisoned for his outspoken antislavery views. In 1831 he founded *The Liberator* in Boston, without capital or subscribers, a paper which he carried on until slavery was abolished. He was threatened with imprisonment and even with assassination, and a mob severely handled him in Boston in 1835, but he kept to his purpose. He made several visits to England in the interest of the cause he had taken up, and in 1833 he organized the American antislavery society, of which he was afterwards president. He continued his newspaper during the Civil War, and discontinued it in 1865, when the amendment to the constitution prohibiting slavery in the United States was adopted. The same year a number of his friends presented him with $30,000 as a memorial of his services. He died at New York, May 24, 1879. See *Life* by Johnson.

Gar′ter, Order of the, the highest British order of knighthood, was originated by Edward III, probably on Jan. 18, 1344, to reward his most distinguished comrades in arms in his struggle with France. The story is told that the king was dancing with the countess of Salisbury, and when she happened to drop her garter, he picked it up and presented it to her, saying at the same time, in French, with reference to those who smiled at the action: "Dishonored be he who thinks ill of it," which became the motto of the order. It was founded in honor of the Holy Trinity, the Virgin Mary, St. George of Cappadocia and St. Edward the Confessor, but St. George is always accounted its special patron. The habit and badges of the order are the garter of dark-blue velvet, edged with gold, bearing the motto in golden letters, worn on the leg below the left knee; the mantle; the hood; the surcoat or gown; the hat; the plume; the golden collar; the George, a figure of St. George on horseback meeting the dragon; the star; and the ribbon. The order consists of the sovereign and 25 knights and such descendants of George II as shall be elected, besides distinguished foreigners. The Prince of Wales, son of the ruling sovereign, is always a member. The members write the title K. G., Knight of the Garter, after their names. See Sir Harris Nicolas' *History of British Orders of Knighthood.*

Gary, Ind., about 22 miles southeast of Chicago on Lake Michigan, was established by the U. S. Steel Corporation in 1906 in connection with the location of the largest plant in the west. Within two years what had been sand dunes and swamp was occupied by a modern well-built city of several thousand inhabitants with a modern school system worked out on such original and practical lines that it was known throughout the country. Population about 75,000. See School System at Gary.

Gas, a term applied to a vapor which cannot be condensed to a liquid at ordinary temperatures and pressures. Thus, in the ordinary conditions of the atmosphere, air is a gas, and other gases are oxygen, hydrogen, nitrogen etc. Gases have small densities as compared with liquids and solids; air, which is about 14 times as dense as hydrogen, is only about $\frac{1}{800}$ as dense as water. Gases have no definite surface boundary, but occupy any space within which they may be confined. With a given quantity of gas, the smaller the containing vessel the greater the pressure exerted on its walls; and it is true, for all practical purposes, that twice a given pressure reduces a given volume one half. If two gases be brought together, they will gradually mix with one another, even though the mixing has to take place in opposition to gravity. Thus, if a bottle of carbonic acid be connected by even a slender tube with a bottle of hydrogen placed above it, some of the heavy carbonic acid will make its way into the upper bottle, and a corresponding volume of the light hydrogen will descend into the lower, and within a few days the two gases will be completely mixed. The same thing will result even if the two gases be separated by a thin membrane or a piece of unglazed porcelain. Gases may, in many cases, be dissolved in liquids, as ammonia and carbonic-acid gas.

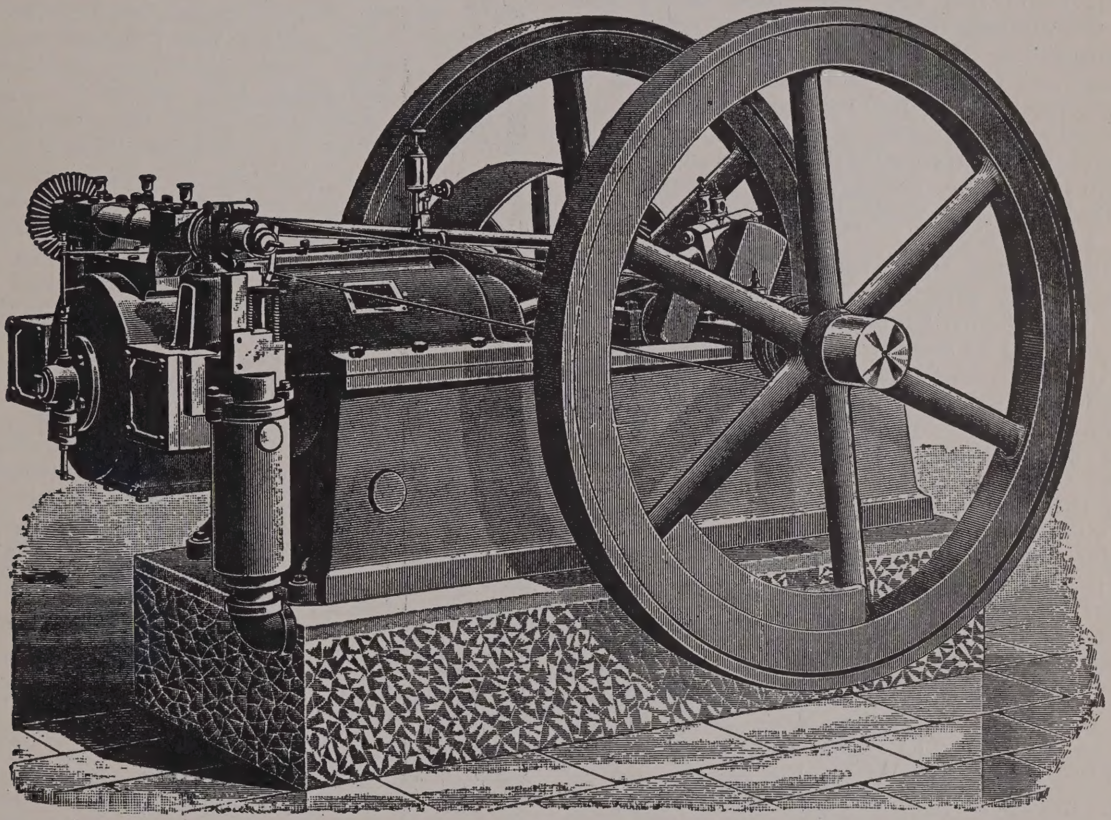
Of gases used for lighting or heating, there are various kinds. The most common kind is coal-gas, made from bituminous or soft coal. The principle of the manufacture of coal gas may be seen in the following experiment: Powder a little coal and put it into the bowl of a common, long tobacco-pipe; then cover the top with moist clay, let it dry, and then heat the bowl. Soon there will come out at the end of the pipe a yellow smoke, which is coal-gas, and this will burn when a light is brought to it; in the pipe is left some coke or carbon. In manufacturing this gas, instead of tobacco pipes, large ovens of brick or iron are used, called retorts. Large works may have a hundred furnaces, each of which has from five to ten retorts. The gas is purified by various processes from the other products of the coal, as tar and ammonia.

Other kinds of lighting gases are oil-gas, made from heavy mineral oils or, as in Australia, from waste mutton-fat, and used sometimes to light railroad-cars and steamships; water-gas, made by passing steam through glowing coke; wood-gas and peat-gas. Besides these artificial gases, an important gas, both for heating and lighting, is natural gas, which issues from the earth in many places. This gas has long been used in China, and near the Caspian Sea there are several so-called eternal fires which are supported by gas escaping from the soil. But it is chiefly in North America that natural gas has been found and used. It came into notice in connection with the digging of oil-wells, and was for a long time looked upon as a disadvantage. The general use of it for burning began only in 1872 in Pennsylvania. Many of the gas-wells lasted only four or five years, but some then sunk are still in use. Two years later manufactories began to use it, and one smelting company now uses a million cubic feet every hour. Natural gas is also found in Ohio, Indiana, Kentucky, Kansas, Dakota and (slightly) in California. It is believed by many that it will soon be exhausted. See Miller's *Chemical Physics.* See Natural Gas.

Gas-Engine, an engine driven by the force produced by the explosion of a mixture of air and a gas. A gas-engine is a form of internal-combustion engines, because the fuel, the gas, is burnt in the cylinder of the engine. The first gas-engine used practically was that of Lenoir (1860). Air and gas were drawn into the cylinder in suitable proportions, and, as soon as the inlet-valve was closed, the mixture was exploded by an electric spark. The cylinder was kept cool by a water-jacket. The engine was not economical. It used from four to five times as much as a good modern gas-engine. In 1866 Otto and Langen invented a gas-engine which used only about half the gas that Lenoir's engine did. The explosion occurred in a vertical cylinder under a piston which was driven up. The piston then came down under atmospheric pressure, and was in gear with the shaft only during the down stroke, so that the work was done only on the down stroke. It was very noisy and did not come into general use. In 1876

Otto brought out the present four-stroke cycle engine. It was a reinvention of an engine which had been patented in 1862 by Beau de Rochac, but had not been successfully introduced. In the Otto engine the mixture of air and gas is drawn into the cylinder during the second stroke; it is here exploded and during the third stroke expands; on the fourth and return stroke the cylinder is cleared for a new charge. This was the first gas-engine used extensively, and all the practical gas-engines of to-day show no marked departure from the Otto four-stroke cycle. The ignition of the mixture at the proper instant may be done by an electric spark, but is often done by a small gas-jet and a heated ignition-tube. The speed is generally regulated by a centrifugal governor (see GOVERNOR, ENGINE) which controls the supply of gas. Within a few years the use of gas-engines has increased very rapidly. Their adaptation for small powers was evident immediately. Even if the fuel-cost be greater than for a steam-engine, this is more than balanced by the convenience and economy in attendance. Then the gas-engine is costing nothing for fuel when it is at rest, so that it is specially adapted for places where power is only needed a fraction of the day.

But the efficiency of gas-engines in transforming the heat-energy of the fuel into work is from 20 to 25 per cent., twice that of small steam-engines, and, with cheaper fuel than ordinary illuminating gas, it is claimed that gas-engines compete with steam-engines for all-day loads. Recently the vapors of gasoline and petroleum have come into successful use as fuel for such engines. The oil-engine differs from the gas-engine only in being provided with some sort of vaporizer whereby the oil is converted from a liquid to a gas on its way to the cylinder. One of the remarkable exhibits at the Paris exhibition of 1900 was that of large gas-engines. The largest gas-engine at the Chicago world's fair in 1893 was one of 35 H. P. At the Paris exposition of 1900 there was one engine of 1,000 H. P., and gas-engines giving a hundred H. P. or more were shown to be very common in practice to-day.



A GAS-ENGINE

The gas-motor of Mr. R. Diesel has attracted a great deal of attention from engineers. In the Diesel motor the compression of the mixture (vapor or gas) which was the feature of the Otto engine is carried still further, even to the point of raising the temperature of the mixture to ignition. Tests of this engine give the highest efficiency of any form of heat-engine, but the engine has not yet come into general commercial use.

A. P. CARMAN.

Gates, Horatio, an American general, was born in England in 1728, and, entering the British army, was an officer under Braddock, at whose defeat in 1755 he was severely wounded. He settled on an estate in Virginia, and at the outbreak of the Revolution he espoused the cause of his adopted country, and in June, 1776, was given the chief command of the army which had just retreated from Canada. In the following year he succeeded Schuyler in the command of the northern army; and the defeat and surrender of the British army under Burgoyne, at Saratoga, which followed, gave Gates a brilliant reputation, though the glory belonged in some measure, at least, to Schuyler. Soon afterwards the so-called Conway cabal intrigued to give the supreme command, which Washington held, to Gates, and after that Gates held no command, until in 1780 he was made commander of the southern forces. The disastrous battle of Camden on August 16 deprived him of his military laurels. He was superseded, and was not acquitted of blame by court-martial until 1782. Two years later he freed all his slaves, and settled in New York, where he died April 10, 1806.

Gatineau. Important river 400 miles long in the province of Quebec. Empties into the Ottawa River. Of great commercial importance to the immense lumber-interests of the Ottawa Valley. The whole of the Gatineau valley, comprising an area of 10,000 square miles, is traversed by it. The water power of the cascades on this river is calculated to equal 40,000 H. P. and the rapids of St. Joseph and Des Eaux at 7,700 H. P.

Gat′ling, Richard Jordan, American inventor, of Gatling-gun fame, was born in Hertford County, N. C., Sept. 12, 1818. Early in life he assisted his father in constructing a machine for sowing cottonseed, and himself invented a machine for sowing rice, which he later adopted for sowing wheat. In 1862 he invented the revolving gun known by his name, and in 1886 invented a new gun-metal, consisting of steel and aluminum. He also invented a steam-plow and a hemp-breaking machine. Congress voted him $40,000 for proof-experiments in a new method of casting cannon. He died on Feb. 26, 1903.

Gaul. See FRANCE.

Gauss (*gous*), **Karl Friedrich,** a noted German mathematician, physicist and astronomer was born at Brunswick, April 23, 1777, and died in Göttingen in 1855. In his 30th year he was appointed director of the observatory at Göttingen, where he spent the remainder of his life. At 25 he had published a very important mathematical paper; at 32 he published his great work on mathematical astronomy, entitled *Theory of Motion of Celestial Bodies.*

In conjunction with Wilhelm Weber, professor of physics in the University of Göttingen, he made an elaborate and profound study of the earth's magnetism and instituted our modern system of absolute magnetic measurements. To Gauss is also due our only satisfactory and accurate method of discussing optical instruments.

Gautier (*gō′tyȧ′*), **Théophile,** a distinguished French novelist and *littérateur,* was born at Tarbes, Aug. 31, 1811, and died at Neuilly, Oct. 22, 1872. He began life as an artist, but abandoned painting for literature. Early in his career, having become acquainted with Victor Hugo, he threw himself into the romantic movement, which at this time manifested itself in French literature. In 1835 appeared his notable novel, *Mademoiselle de Maupin,* which, in spite of its licentiousness, established its author's fame. After this followed a number of essays and sketches in literary criticism, including two admirable monographs on Lamartine and Charles Baudelaire. Later he traveled considerably, producing, as the result of his tours, a series of delightful works on Spain, Algeria, Italy, Belgium, Holland, Russia, Constantinople and Athens. Returning to fiction, he wrote *Captain Fracasse, Spirite* and *The Romance of the Mummy,* all full of captivating writing; together with a number of brilliant short stories, of which the most striking, perhaps, is *A Night with Cleopatra.* He also produced many short plays for the stage, besides a *History of French Dramatic Art* (since 1845) and numberless scattered pieces in prose and verse. He possessed, with eminent descriptive powers, a delightfully facile style and great artistic taste. His last book, written during the German siege of Paris, was his *Siege Pictures.*

Gay, John, an English poet, was born in 1685 and died in 1732. He wrote a large number of poems and ballads, besides several operas; but little of his poetry is now read. His greatest success was *The Beggar's Opera,* which ran 62 nights, made the actors celebrated, and in the popular phrase, "made Rich [the manager] gay, and Gay [the author] rich." His *Fables* and his ballad of *Black-eyed Susan* also deserve mention. See Henry Morley's *English Literature.*

Gay=Lussac (*gā′lü′sȧk′*), **Joseph Louis,** a French physicist and chemist, was born Dec. 6, 1778, and died at Paris, May 9, 1850. His father's name was Antoine Gay, to which the title Lussac was added, in connection with the ownership of some property. Gay-Lussac was educated at the Polytechnic School in Paris, which he entered at 19. In 1804 he made a great reputation by ascending alone in a balloon to the height of 23,000 feet and there making observations on the earth's magnetism, the moisture of the air etc. For 24 years. beginning in 1808, he was professor of physic in the Sorbonne which he left to become professor of chemistry at the *Jardin des Plantes.*

One of his most important pieces of work is that in which he proves that, when gases combine with one another by volume, they do so in simple proportions. Thus two volumes of hydrogen combine with one volume of oxygen to form two volumes of water. Equally important, perhaps, is his discovery of the manner in which gases change volume or pressure when the temperature changes. For description of this, see BOYLE'S LAW.

Among his chemical investigations, perhaps his demonstrations of the nature of iodine and of hydrochloric acid are as important as any. In addition to his scientific accomplishments, he was a man of extraordinary breadth, a member of the Chamber of Deputies, widely traveled and largely acquainted with men.

Gazelle. See ANTELOPE.

Geary, John White, American soldier and governor of Pennsylvania, was born near Mount Pleasant, Pa., Dec. 30 1819, and died at Harrisburg, Pa., Feb. 8, 1873. Early in life he studied law, but never practiced. During the Mexican War he acted as colonel of the 2d Pennsylvania regiment, and was made first commander of the City of Mexico. In 1849 he was appointed postmaster of San Francisco, and in the following year became mayor of the city. In 1856 he was created territorial governor of Kansas. At the opening of the Civil War he raised the 28th Pennsylvania volunteers and rose to the rank of major-general. He took part in many notable engagements and was with Sherman in his march to the sea. In 1866 he became governor of Pennsylvania and held the office until his death.

GENERAL GEARY

Gehenna (*ge-hĕn'ȧ*) or, in Hebrew, **Valley of Hinnom,** was a narrow gorge south and west of Jerusalem. Under the later Jewish kings it became a favorite place for the celebration of idolatrous rites, and when King Josiah restored the old national faith, he "defiled" the valley by covering it with human bones. After this it became the common cesspool of the city, into which its sewage was brought, to be carried off by the waters of the brook Kedron. It is also said that fires were kept constantly burning here to consume the bodies of criminals, the carcasses of animals and whatever else could be burned. Among the later Jews Gehenna and Tophet came to be symbols for hell and torment.

Geijer (*yī'âr*) **Eric Gustaf,** a noted Swedish historian, was born in Wermland, Jan. 12, 1783. Devoting himself to the study of history, he became professor of that branch in the University of Upsala. He also wrote poems and political essays, and was known as a composer and musician. He died on April 23, 1847. His historical works are chiefly confined to the history of his own country.

Geikie (*gē'kĭ*), **Sir Archibald,** F. R. S., director-general of the British geological survey and an eminent authority in geological science, was born at Edinburgh, Scotland, Dec. 28, 1835, and educated at the high school there and Edinburgh University. In 1855 he entered the geological survey and rose to be director-general of the geological survey of Scotland and first Murchison professor of geology and mineralogy at the University of Edinburgh. He has been president of the British Association and of the geological society, and is director-general of the geological survey of the United Kingdom. He has written largely on his special topics, and received many foreign decorations and honors. His chief books are *The Story of a Boulder, Textbook of Geology; Field Geology; Class-book of Geology; The Ancient Volcanoes of Britain;* and he has written biographies of *Edward Forbes, James D. Forbes, Sir Roderick Murchison, Sir Andrew Crombie Ramsay* and other eminent scientists.

SIR ARCHIBALD GEIKIE

Gem'mae (in plants), peculiar reproductive bodies formed mostly by certain liverworts. Each gemma is a disk-shaped mass of cells, and on being separated from the plant it produces a new body. See HEPATICÆ.

Gen'erative Cell (in plants), a general phrase, but technically a cell which is enveloped within pollen-grains, and which gives rise more or less directly to the male cells or sperms. It is a cell which appears in connection with the very small male gametophyte which the pollen (an asexual spore) produces.

Genet (*zhĕ nā*), **Edmond Charles Edouard,** a French diplomatist, was born at Versailles in 1765, and died at Schodack, New York in 1834. At an early age he showed considerable talent as a linguist. After serving for three years in diplomatic service in St. Petersburg, in 1792 he became minister plenipotentiary to the United States. His mission was to have them declare war against England. He was well-received on his arrival and soon began to seek recruits through agents. As Washington, however, had assumed a position of neutrality, Genet was soon notified by Jefferson, then secretary of state, that he must cease to arm and equip privateers in American ports. As he did not obey Jefferson's command, he was recalled by the French government upon the request of Washington. He afterwards became a naturalized American citizen, and married a daughter of Governor George Clinton of New York.

Geneva, Lake of, or **Lac Leman,** lies between Switzerland (to which the greater part of it belongs) and France. It is 1,218 feet above the sea, and stretches 45 miles from east to west in the form of a crescent. Its greatest breadth is 9 miles, its area 223 square miles, and its greatest depth 1,092 feet. The northern shore is a classic spot, celebrated by Rousseau; and by Byron in *Childe Harold* and *The Prisoner of Chillon.* The southern shore has as a background the mountains of Savoy. From the lake Mount Blanc is visible, and, although 60 miles distant, is often reflected in its waters.

Geneva, N. Y., a town in Ontario County, on Seneca Lake, 50 miles southeast of Rochester. It is advantageously situated on high ground, and is the seat of Hobart College, the State Agricultural Experimental Station and of the Delancey Divinity School and school for girls. It is noted for its extensive nurseries. It has a good high-school and well-equipped grammar and kindergarten schools, fine churches and an hygienic institute. It has numerous factories, including stove-foundries, steam-heating boilers, optical works and a fruit-preserving establishment. Population 16,000.

Geneva, capital of the Swiss canton of the same name, is situated at the point where the Rhone leaves Lake Geneva. A Gallic town originally, it fell successively into the hands of Romans, Burgundians and Franks, and, having become the seat of a bishop, a continual feud was carried on from the 12th century between the bishop and the counts and dukes of Savoy. In the meantime the citizens gained considerable liberty, and, in the 16th century, by allying itself with Freiburg and Bern, the republic of Geneva won complete independence. A few years later the republic became Protestant, and Calvin came to Geneva and made it one of the chief strongholds of Protestantism in Europe. During the 18th century it was torn by party strife, and during the French revolution the government was overthrown, and a reign of terror followed. Annexed to France, it again became independent, and in 1815 the city, with its adjoining territory, joined the Swiss confederation as the 22d canton with a representation of seven members in the Swiss National Council. There have since been several conflicts between the popular and aristocratic parties.

Formerly surrounded by walls and in other respects an ancient town, Geneva within the last half-century has become a beautiful and convenient modern city. The Rhone, passing through, forms two islands, on one of which still exists an antique and picturesque cluster of buildings; on the other, laid out as a pleasure-ground, is the statue of Rousseau. Among the fine buildings are a cathedral, which dates back to the 12th century; the university (with 1,158 students and a teaching-staff of 133 members), founded as an academy by Calvin; one of the finest theaters in Europe; and a number of valuable museums. Geneva is famous as a theological, scientific and literary center, and has given birth to many great men, among them being Rousseau, Necker (the famous French minister of finance and father of Madame de Stael), Sismondi, Casaubon, De Candolle and Cherbuliez. Watches, musical boxes and jewelry are the staple manufactures. Geneva is also a canton of Switzerland, with an area of 108 square miles and a population of 150,173. Population of the city 125,520.

Genghis Khan (*jen′gĭs kän′*), meaning Very Mighty Ruler, a celebrated Mongol conqueror, was born in 1162, at Deylun Yeldâk, on the River Onon. The son of a Mongol chief, he was called upon to rule his father's people when only 13 years old, and he had to struggle hard for several years against revolts and factions. He was ambitious for conquest, and, starting with a dominion comprising most of the region between the Amur and the Great Wall of China, he conquered empires stretching from the Black Sea to the Pacific, and organized them into states which endured far beyond the short span that usually measures the life of Asiatic kingdoms. He subdued, one after the other, the Keraits; the Naimans, a powerful Turkish confederacy; Tangut, a Chinese empire near the desert of Gobi; and the empire of North China. He then turned westward and conquered as far as India, the Persian Gulf and the Black Sea. Two of his generals even passed through southern Russia, and entered the Crimea, everywhere routing and slaying, and returned by way of Great Bulgaria and the Volga.

a wonderful military raid. Genghis died in 1227. See Howorthy's *History of the Mongols* and also Curtin's.

Gennesaret, Lake. See GALILEE.

Gen'oa, a city of Italy, situated on the Mediterranean gulf of the same name, at the foot of the Apennines. It is an important seaport and the capital of a province. The province has an area of 1,582 square miles with a population of 989,538. The slopes of the hills behind the city, down to the shore, are covered with buildings, terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges, rising still farther back, are capped with a line of strong forts, batteries and outworks. The fine half-circle harbor, protected by piers and moles affords an outlet for the products of a wide extent of country — rice, iron, olive oil, silk goods, coral, paper, macaroni and marble. Over 6,000 vessels enter the port yearly, three fourths being Italian. Among the industries are iron-works, macaroni-works and paper-factories. There are many palaces, interesting because of their historical fame and architectural beauty, and some of them contain valuable galleries of paintings. The fine old churches also are splendid with marbles, paintings and rich gildings, among them the Gothic cathedral of St. Lorenzo, built in the 12th century. The university, founded in 1243, with 64 teachers and 1,276 students and auditors, has a library of 120,000 volumes, and there are other academies and schools and one of the finest theaters in Italy.

The history of Genoa presents much the same features as other ancient Italian cities. After falling under the sway of several powers, it became an independent republic, and to protect itself against the Saracens it formed an alliance with Pisa. At the close of the 11th century Genoa commanded large naval forces, and ranked as a powerful naval state, its main power being in its commerce. Internal troubles and wars with Pisa, Venice and the Moors followed, and it again became a subject-state of Milan and then of France. In the 16th century Andrea Doria restored the republic, but it again became a part of France, and in the past century was made a part of the kingdom of Italy. The Genoese are skillful and hardy seamen, and are noted for their spirit of enterprise and freedom. Among the sights of the city is a monument to Columbus, the most famous citizen of Genoa. Population 275,000. See J. T. Bent's *Genoa*.

Genseric (*jĕn'sẽr-ĭk*), the greatest of the kings of the Vandals, was, with his brother Gonderic, ruler of the Vandals after their settlement in Spain. After crushing the Suevi, he led the united Vandals and Alans into Africa in 429 A. D. All Africa west of Carthage fell into his hands. Seizing that city in 439, he made it the capital of his new dominions, and dated his reign, which lasted thirty-seven years, from this conquest. With such cruelty and ferocity did the Vandals lay waste cities, churches and fields, that their name is still used to describe barbarous acts. Genseric quickly built up a great naval power, and his fleets scoured the Mediterranean. In 455 he captured Rome and plundered it for fourteen days. Two expeditions sent to avenge this insult were completely destroyed. Genseric died in 477, to the last holding all his conquests. With great genius as a conqueror and ruler, he made religion the excuse for ruthless cruelty. Once, when leaving the harbor of Carthage on an expedition, his pilot asked him whither he was going. "Against all who have incurred the wrath of God," said the conqueror. He was of low stature, and lame on account of a fall from his horse, always absorbed in his plans, caring little for pleasure, subject to bursts of fury and greedy of conquest.

Gentian (*jĕn'shan*), a widely distributed genus of plants, is of use in medicine for the bitter drug that is made from the roots and used to stimulate the appetite. The common yellow gentian which is so employed abounds at a high altitude in Asia Minor, the Alps and the Pyrenees. The abundant yellow flowers of this gentian, growing upon stems some three feet in height, make it one of the beauties of the mountains. Species of gentian are found not only in Europe and Asia, but in North and South America and even New Zealand. The gentian can only with the greatest difficulty be cultivated as a garden-plant.

FRINGED GENTIAN

Geof'frey of Anjou. Geoffrey (or Geoffry), Count of Anjou and Maine, provinces in France, married Matilda, daughter of Henry I, King of England. On the death of William, Henry's son, Matilda became heir to the English crown and to the duchy of Normandy; but these were seized by the more popular Stephen. In Matilda's fight for the crown Geoffrey took little part; but he fought unsuccessfully for the possession of Normandy. He died about 1150. His son, Henry, won Normandy in 1151, and made a treaty with the childless Stephen, securing his succession to the English crown as Henry II. Thus Geoffrey, a descendant of the terrible Count Fulc of Anjou, is the ancestor of all succeeding English monarchs. He gained the title Plantagenet from his habit of wearing in his helmet the common broom of Anjou (*planta genista*) His descendants received this title as a surname.

Geog'raphy means strictly a description of the earth. As now used, it is that branch of science which treats of the features of the earth's surface, the division into countries and the plants and animals, including man, which cover it. It may be divided into *physical geography*, dealing with the form and motions of the earth, the atmosphere or air-covering, the land-surface and the water-covering, the facts that make up climate, the great classes of rocks that make up the surface and the leading classes of plants and animals which cover it; and *political geography*, giving an account of the different states or communities into which man is divided. The terms commercial geography, which discusses the products and commerce of the different parts of the world; medical geography, dealing with different places as liable to certain diseases; and oceanography, which investigates the ocean and its inhabitants, are also sometimes used. Thus the study of geography touches in various ways upon many other sciences, as geology, history and astronomy.

The progress of geographical knowledge has depended largely on the progress of discovery. The Phœnicians were the first people who communicated to other nations a knowledge of distant lands. Their voyages before the time of Homer, through the Euxine, the Mediterranean and even into the Atlantic form the first link of the great chain of discovery which, centuries later, was extended by Columbus to the shores of America. Travelers like the Greek historian, Herodotus, whose *History* gives a complete representation of what was known of the earth's surface in his age, did much for the advancement of geography, as did also the exploring and surveying expeditions of Alexander the Great. At the same time Pytheas, the Massilian navigator, was following the path of discovery in the north, possibly as far as Iceland, and in 276 B. C. Eratosthenes first used parallels of longitude and latitude and made maps on mathematical principles. By this time the old idea of the earth as a flat, circular shield surrounded by a rim of water had given place to the belief that the earth is a sphere, revolving with the surrounding atmosphere on one and the same axis. The practical genius of the Romans led them to make a study of the resources of the countries they conquered, which did much for geography. Their greatest work was a survey of the whole empire, including a description and measurement of each province, which was made under Cæsar and Augustus. In the second century of our era Ptolemy wrote a work on geography, in eight books, which for many centuries was regarded as the most perfect system of the science.

The travels of the Venetian, Marco Polo, in the 14th century opened new fields of inquiry, and the close of the next century was marked by the discovery of the American continent. Within thirty years the whole coast of America, from Greenland to Cape Horn, had been explored; the Pacific Ocean had been navigated by Magellan and the world circumnavigated by his ship; the coasts of eastern Africa, Arabia, Persia and India had been visited; and numerous islands in the Indian Ocean discovered. The attempts to find a northwest passage to India increased the knowledge of the Arctic regions. Captain Cook by his long voyages dispelled the old belief in the existence of a great Antarctic continent, and the Antarctic lands have been visited during the 19th and 20th centuries. In the 17th century the Dutch made the Australian islands (which the Portuguese had discovered about 1500 or else in 1601) known to the world, but it was not until within a few years that the first successful voyage was made through the northeast passage around Europe and Asia and through the northwest one around America. In America the travels of Humboldt, Lewis and Clarke, Frémont and others and the work of the United States and Canadian surveys have done much to add to our scientific knowledge. Africa, Asia and Australia are pretty well-known, but are still lands of exploration, though great areas in each have been opened in recent years. Commander Peary, U. S. N., who on April 6, 1909, reached the long sought North Pole; and Nansen; and Sven Hedin in Tibet in 1906–8 are but a few of the many who have enormously extended geographical knowledge recently. The work of making geography is still going on, and is constantly becoming more complete and important. Among the most valuable efforts in this direction may be mentioned the deep-sea exploring expeditions. See PHYSIOGRAPHY.

Geography, Teaching of. Geography is the study of the earth's surface as the home of man. It differs from physiography in this: that while physiography deals with the question how the earth came to be what it is, geography devotes itself to the effects of surface features upon mankind. The chief characteristic of the study is the relativity of man to his home, and not, as often assumed, a mere description of the earth's surface. Neither is the study of man alone any nearer approach to geography but, if anything, a wider departure. Not the home alone, nor man himself, but man in his home,—that is the function of geography proper. To Karl Ritter, the first great teacher of the subject, is due the credit of the present view of the true field of geography. The best-adapted definition of Ritter's somewhat involved one is, possibly, that of E. C. K. Gonner of University College, Liverpool: *Geography may be described as the meaning to man of the earth and its features as they are.*

Such being the scope of the subject, it is possible for its study to begin in the first grade. The outline of a course of study in geography, given by F. W. Parker in his treatise on *How to Study Geography*, is suggestive for all the grades, but that part of it which deals with the work of the first grade deserves distinctive mention. It aims to help the child to find himself, to realize his environment and the relations, so far as he may be capable of observing them, that exist between himself and his home. So taught, it must follow that the child will recognize the meaning which relates the Eskimo to the tundra, the Tibetan to the plateau, the Kirghiz to the steppe, the Negrito to the forest and the Troglodyte to his cave. Studied in the way indicated, strange people will not necessarily seem "freaks," nor other parts of the earth "out of his world." His larger knowledge must increase his humanity, and enhance his appreciation of the earth.

In the first three years of school there is scarcely any need of a separate "study" called geography, such work as that just mentioned being incidental to a study of primitive life, nature-study and other subjects.

But in the fourth or, at latest, in the fifth year of school, geography should find a separate place in the program of studies. The first large subject should be home-geography, in which one takes up systematically the study of the home environment. Most of the principal ideas used in geography can be gotten by careful observation of one's home-surroundings. In this way later geography can be founded on a concrete basis.

The worth of later geography depends very much upon the prominence given to the causal idea. The work is dead, if this idea is omitted and the effort is directed chiefly to location. Here is found the chief difference between the old geography and the new; the former was descriptive and static, the latter is causal and dynamic. If one conceives of the whole earth as a developing body and of the various industries as developing in each country under the influence of *causes*, the study will prove thoroughly interesting and energizing. And that is what modern school geography endeavors to do.

As aids to geography-teaching, a magnet, a compass, a dipping needle, a dial, a weather-vane, a rain-gauge, a thermometer, a barometer, stencils, colored crayon and small papier-maché globes will be found useful from the first, although good work can be done without many of these. For advanced work there are numerous more complex pieces of apparatus that are of value.

If there is one thing needing emphasis in geography teaching, it is more laboratory work, more of the fields, more of the world about us and less of books. Study of the home, therefore, is not to be considered as *finished* after a few months of work upon it in the fourth or fifth year of school.

Geography logically begins with nature study, and develops through an extension of community environment to continental and world environment. It includes such a variety of surface, meteorological, climatic, biological, industrial, commercial, social and political problems, that local material need never be wanting; neither need concrete illustrations in great variety be lacking as the vision of the pupil is extending beyond his own neighborhood.

The making of models representing groups of people in typical settings of the regions which they inhabit will always prove interesting and instructive. A lesson in modeling groups to represent *The Seven Little Sisters* will not fail to satisfy the teacher of the advantage of such work.

The sources of information on this subject other than the regular texts are authenticated cuttings from newspapers, articles in magazines, bits of personal experiences and books of travel, of which there are now hundreds written in a most delightful manner. Such books as Nansen's *Farthest North*, Abruzzi's *The Ascent of Mt. St. Elias*, Hedin's *The Roof of the World* and Borchgrevink's *Story of the Farthest South* are of especial worth, bringing to the class reliable matter rendered doubly interesting by the intensely personal flavor of the recital. It is to be doubted whether there is a better set of books in any single series for geographical work than Reclus' *The Earth and its Inhabitants*. The voluminous publications by our state and national government are also of great value.

For the teacher *The Statesman's Year-Book*, Redway's *The New Basis of Geography*. *The International Geography*, edited by H. R.

Mill, and Adams' *Commercial Geography* are almost indispensable. It should go without saying, of course, that every class-room for the scientific teaching of geography should be supplied with a globe, up-to-date maps, atlases, gazetteers and current geographical magazines.

Ge'olog'ical Survey, United States, is a bureau that was organized by the Department of the Interior in 1879 to bring together the scattered surveys of many western districts and construct geological maps of the United States. The bureau continues to pursue its investigations concerning the products of the country, its mineral resources and the means and possibilities of irrigation. The maps are made in such detail that the scale is never less than four miles to the inch; and is often as large as one mile to the inch. The heights of places are shown by lines, called contours, which represent an equal distance above sea-level. The maps, as they are made, are at once published in folios. The director of the survey issues an annual report. Full information upon the work of the bureau may be gained from the reports of the director, together with Walcott's *The United States Geological Survey*, Washington, 1895.

Geol'ogy. Geology is the science which deals with the history of the earth. It is the task of geology, not simply to recite the history of the earth so far as it is known, but to show how this history became known and how the limits of knowledge are being extended. Geology is a young science, and in its study at the present time it is needful to take cognizance of the limitations of present knowledge as well as of the knowledge itself. Everything which throws light on the history of the earth falls within the field of geology. The history of the atmosphere and the history of the ocean are really parts of geology, since the atmosphere and the ocean are parts of the earth. The popular impression, therefore, that geology has to do only with the rocks of the earth is not altogether adequate. The rocks of the earth, to be sure, furnish the larger part of the data for unraveling the history of the earth, though they are not the only sources of information. It is to be remembered, too, that in the study of the rocks, it is study of them for the sake of the light they throw on earth-history, rather than study of them for their own sake, with which the geologist is primarily concerned.

In working out the history of the earth, so far as it has been worked out, the line of approach has been through the study of the changes which are now taking place on the earth's surface. The rain falls on the land, and some of it gathers into streams, and the streams flow into the sea. In the flow of the water the substance of the land is worn away, the material carried to the sea and deposited there in the form of gravel, sand, mud etc. The sand and mud need nothing but cementation to become sandstone and shale, two of the commonest sorts of rock found on the land. The process of cementation is now going on by natural means in many places. In the sand and the mud, as they are deposited in the sea, shells of various organisms are often imbedded. The shale and sandstone of the land also contain shells and other traces of marine organisms. Hence it is inferred that the sandstone and shale, as well as certain other sorts of rock found on the land, were originally deposited as beds of sand and mud, etc in the sea and that they have since been elevated to the condition of land.

The activities of other surface-agencies are similarly studied. The detailed study of the work now being done by rain and rivers, underground water, waves and currents, the atmosphere, glaciers, changes of temperature, gravity, organic agencies and all other forces and activities operative on the surface of the earth has taught geologists how to interpret the rocks formed in ages long past. It is by the interpretation of the recorded results of the past, in the light of the processes now taking place, that the science of geology has grown up. The study of present processes is becoming more and more exhaustive, and the application of this increased knowledge of present processes to the records of the past is continually enlarging and perfecting our knowledge of the earth's history.

Geology should begin with the origin of the earth, and at this point it trenches upon the field of astronomy. The early ages of the earth's history are as yet speculative. There seems to be good reason for doubting the truth of the nebular hypothesis, which has so long been regarded as satisfactory. The only rival hypothesis which has been framed is the meteoric hypothesis, which affirms that the earth is made up of an aggregation of meteorites comparable to the meteorites and shooting stars, which daily reach the earth by millions at the present time. While the stages of the earth's history preceding the beginning of sedimentation are, at the present time, largely conjectural, many lines of investigation are being pursued which ultimately may throw much light on the early and obscure portions of the earth's history. The general outlines of this history since sedimentation began are probably fairly well-understood, though increased knowledge may modify present conceptions at many points.

The rocks of the earth which contain the principal records of the earth's history are of three great classes; (1) Igneous rocks or those which represent solidified lava; (2) sedimentary rocks, as shale, sandstone, conglomerate, etc., most of which are made up of fragments of older rocks; and (3) metamorphic rocks, which may have been so far altered by various means that they now depart notably from the original forms. In the metamorphism of rocks pressure is the most potent agent. Chemical change, under the influence of moisture, is probably second in importance; and heat third. A special class of sedimentary rocks is due to life. Here belong most limestones, made of shells, corals, etc.; coal, of plant origin; and a number of lesser formations.

The composition, disposition and structure of these several sorts of rock and their fossil contents, so far as they contain fossils, interpreted in the light of processes now taking place, allow geologists to infer the conditions under which the various sorts of rocks are made. When geologists are able to tell what the conditions were on every part of the earth at every period of the past, the science of geology will be complete.

Several subdivisions of geology are often recognized. *Dynamic geology* deals with the agents and forces which have been concerned in making the earth what it is. To dynamic geology belongs the consideration of the activities of rivers, the atmosphere and the ocean, the forces concerned in volcanic action, crustal movements, etc. *Petrography* is that phase of geology which deals with the rocks as such. *Structural geology* is that branch of the subject which deals with the positions of rock-strata and with the relations of rock formations to one another. Structural geology might be defined as the architecture of the crust of the earth. *Physiographic geology* deals with the forms of the surface, and its task is to explain how the present surface came to be as it is. It draws extensively on dynamic geology, since it must consider the forces which have produced mountains, plateaus and plains as well as the details of their surfaces. It draws on structural geology, because the positions in which the rocks occur influence the shape of the surface at the present time. It draws on petrography, because the form of the surface is often affected by the character of the rock beneath. *Paleontologic geology* is that phase of the subject which deals with fossils. The objective point of paleontologic geology is to determine the character of the life of successive ages and the changes which it underwent from time to time. *Historic geology* is that phase of the subject which deals with the application of all other phases of geology to the task of making out the history of the earth, as shown in the rock formations. *Economic geology* is that phase of the subject which deals with the materials of the earth's crust which are commercially valuable. It has to do with ores of all sorts; with coal; with building-stone; with clays which are valuable for the manufacture of brick, pottery, etc.; with materials which can be used for pigments; sand, which can be used for glass; with precious stones; with abrasive materials; with asphaltum, petroleum, natural gas, salt, fertilizers etc. The function of economic geology is to determine the origin of these substances and, so far as possible, the laws which govern their distribution.

Geologic time is divided into five eras and most of these are divided into several periods, as shown in the following table:

ERAS	PERIODS	
Cenozoic....	Pleistocene (Glacial)	
	Pliocene	Tertiary
	Miocene	
	Eocene	
Mesozoic....	Cretaceous	
	Jurassic	
	Triassic	
Paleozoic...	Permian	
	Carboniferous	
	Devonian	
	Silurian (= Upper Silurian)	
	Ordovician (= Lower Silurian)	
	Cambrian	
Proterozoic..................	Algonkian	
Archean......................	Archean	

The Archean era was the time occupied in the making of the oldest system of rocks. The Archean rocks are mostly metamorphosed igneous rocks, though with them there are some metamorphic sedimentary rocks. Fossils have not been found in this system of rocks, but it cannot be asserted that life did not exist.

The Proterozoic era is the time during which the great system of rocks lying above the Archean and below the oldest abundant fossiliferous rocks was deposited. The rocks of the Proterozoic era are mainly sedimentary, though igneous rocks have great development locally. The formations of the Proterozoic era are many thousands of feet thick, though considerable portions have been removed by erosion. It has been estimated that the Proterozoic era was perhaps as long as all subsequent time. Life existed during this era, as is shown by the few fossils which have been found and by the nature of some of the formations, even where definite fossils do not occur. For example, there are black shales and graphitic slates, the carbon of which probably is of plant-origin. The Proterozoic (Algonkian) rocks of the Lake Superior region contain rich beds of iron and copper.

The Paleozoic (formerly called Primary) era was the time when the several systems of rocks bearing the names Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian were deposited. The time occupied in the deposition of each of these systems is a period. These systems of rocks are mainly of sedimentary origin, and the materials of which they are composed were derived from the land-areas which existed when these systems were being deposited. These materials were washed down from the land to the sea, and there deposited. The several systems of Paleozoic rocks are distinguished from one another by their fossils. Thus, the fossils of the Cambrian system of rocks are sufficiently unlike those of the Ordovician system to be readily distinguished by paleontologists. Even at the beginning of the Cambrian period the range of life was great, all the great types which are living at the present time, except the vertebrates, being represented. Even the vertebrates may have lived, though relics of their existence have never been found. In this period trilobites and brachiopods were perhaps the most abundant and the most characteristic life, judged by the abundance of fossils. In the rocks of the Ordovician system fish-remains have been found and also relics of air-breathing life. Mollusks, crinoids and corals lived in great profusion, in addition to types of life which predominated in the Cambrian period. Most of the oil and gas of Ohio and Indiana come from the rocks of the Ordovician age. In the Silurian period the same general types of life were prevalent, but the species are so far unlike those of the preceding period as to be readily distinguished by those who are familiar with fossils. The Devonian period is often known as the Age of Fishes, on account of the abundance of fish-remains which have been found in the rocks of this system. It is far from certain, however, that fish were more abundant than now, and the variety of fish was probably less than at the present time. The Devonian was, however, the first period when fishes were abundant, so far as now known. The oil of Pennsylvania and Canada is largely derived from beds of the Devonian age. During the Carboniferous period there were extensive marshes in the United States and in some other parts of the world, in which vegetable-matter accumulated in great quantity. These marshes were subsequently submerged, and the vegetable matter was buried by sediments and ultimately converted into coal. Most of the coal of the United States east of the Great Plains was accumulated at this period. Plant-life was abundant, but the plants were largely of types now extinct. It was during this period, as far as now known, that reptilian life began. The Permian period represents a transition stage between the Paleozoic and the Mesozoic era. In the Permian period there was extensive glaciation in Australia, South Africa and India.

The several systems of Paleozoic rocks have somewhat different distribution, and, since the area of the deposits of any period corresponds approximately with the submerged area of that period, the distribution of the several systems helps us to understand the relations of land and water during the several periods. In this way it is known that the relations of sea and land were different at different times. It would appear either that the continent repeatedly oscillated up and down, causing areas which were at one time submerged to rise to above the level of the water at another and areas which were land at one time to sink beneath the sea at another; or else that the sea-level itself fluctuated. If the sea-level rose, it would overspread the low lands; if it were lowered, it would cause areas which had been submerged to become land. How far the changes in geography were the result of land-oscillations and how far they were the result of oscillations of the sea-level has never been determined. So far as present knowledge goes, it would appear that the deep-sea bottom has at no time been land and that the areas which were alternately above and below sea-level were low when they were land, and covered by shallow water only when they were submerged.

The Mesozoic (formerly called secondary) era, as the term indicates, was the era when life intermediate between the ancient and the present existed. This era is divided into several periods, as indicated above. The Triassic formations of North America are somewhat widespread in the western third of the continent, but have but little development in the eastern part and none at all in the interior. During this period reptiles perhaps were the dominant type of life. They were not only numerous, but the individuals attained great size. The earliest remains of mammals date from this period. Marine life abounded, but departed notably from the types which had prevailed in the Paleozoic era. Vegetation was abundant, but of types now extinct or but meagerly represented. The Jurassic period followed, and the distribution of the Jurassic formations is similar to that of the Triassic. The life of this period was, however, somewhat different from that of the preceding, though the same general types abounded. The oldest remains of birds are found in the rocks of this period. The Jurassic period was followed by the Cretaceous or Chalk period. In the early part of this period chalk was not being deposited, but in the later part chalk-deposits were in process of formation in many parts of the earth. The chalk-deposits are made up, for the most part, of the shells of minute marine animals (see CHALK). The Cretaceous formations of North America are much more widespread than those of the Jurassic and Triassic periods. Their distribution indicates that a large part of the North American continent was submerged during some parts of the period. It was during the Cretaceous period that the modern types of plants and of fishes made their appearance. During the last stages of the Cretaceous period extensive accumulations of vegetable-matter were made in the western third of the United States. These were subsequently converted into coal, mostly soft. The coal of the western part of the United States mostly belongs to the late stages of the Cretaceous period.

The Cenozoic era or era of modern life followed the Mesozoic. Mammals, the earliest remains of which are found in the rocks of the Triassic system, abounded during the Cenozoic era, while the huge reptiles which had been especially characteristic of the Mesozoic era had disappeared. Reptiles still existed as now, but they were of relatively small types, and their numbers appear to have been relatively few. As the Cenozoic era progressed, the forms of life approached more and more closely to those of the present time, and by the end of the Pliocene the life was nearly the same as that which now exists. The Pleistocene period was a remarkable one, on account of the great climatic changes which occurred at this time. The result of these climatic changes brought on a glacial climate, and an ice-sheet or series of ice-sheets covered something like 4,000,000 square miles in the northern part of North America. A large ice-sheet was developed, probably contemporaneously, on the continent of Europe, affecting especially its northwestern part. The history of the Glacial period has been worked out in sufficient detail, so that it is known that there was a series of ice-sheets and not a single one. That is, there were several glacial epochs, with intervening epochs when the ice largely or completely disappeared and the climate became genial. Most of the lakes, waterfalls, etc. of the northeastern part of the United States and of the region to the north owe their existence to the glaciation of the area where they occur. The ice reached its most southerly limit in Illinois, where it descended to about 37° 30′.

The duration of the earth's history is a matter which has received much attention, but no conclusions have been reached which can be relied upon, beyond the very general one that the history of the earth has been exceedingly long. Various conjectures as to the number of years occupied in bringing the earth to its present condition have been made. They range from twenty-five million or so to several hundred million. Geologists in general would not be surprised if it could be demonstrated that the history of the earth since Archean time has occupied 50,000,000 to 100,000,000 years. The Proterozoic era was perhaps as long as all subsequent time. The Paleozoic era was perhaps three to six times as long as the Mesozoic, and the Mesozoic was perhaps three or four times as long as the Cenozoic.

The climatic changes which the earth has undergone have been great, but their causes are not well-understood. There is little basis for the belief, formerly widespread, that the climate has on the whole been growing cooler. Cold periods seem to have alternated with warmer ones. Glaciation was extensive at the close of the Paleozoic and, again, late in the Cenozoic, and there is some indication of cold periods at other times. On the other hand the lands of high latitudes enjoyed genial climates during some parts of the earth's history, even as late as the mid-Tertiary time.

Volcanic activity seems to have been greater at some periods than at others, but on the whole to have been about as great, so far as now known, in the early as in the late stages of the earth's history. See Dana's *Manual of Geology;* Scott's *Introduction to Geology;* Le Conte's *Elements of Geology;* Geikie's *Text-Book of Geology.*

R. D. Salisbury.

Geom′etry in its origin was the science of measuring the surface of the earth (Greek *gē*, the earth, and *metron*, measure). With the ancient Egyptians, for instance, it took the form of mensuration, because of the need of a yearly survey of the lands that were left bare and muddy after each annual overflow of the Nile. Geometry now is the science of form; although, indeed, the exact geometrical forms are seldom found in nature. Perhaps one should begin to teach geometry as the Egyptians learned it, through making simple geometrical measurements and surveys in the play-ground, of baseball diamonds, hop-scotch courts, a lawn tennis court and so on. For, according to the strictly logical form of Euclid's teaching, it is seldom that a child perceives the need of geometry or begins with an interest in it. For this reason, too, geometrical properties should be taught in the first place largely by paper-folding and cutting, by the use of models, such as the kindergarten gifts, and by the graphical representation of facts that have to do with the other interests and studies of children. The classic work upon Geometry is still the *Elements* of Euclid, who wrote about 285 B. C. in the great days of Alexandria. But geometers of the 19th century declined to be bound by the *Elements.* There arose a *new geometry*, which began perhaps with Carnot. It certainly is necessary for the teacher of geometry to abandon the logical order of Euclid for a more practical and interesting and, in short, more psychological method.

Geoph′ilous Plants are those plants with special subterranean structures which enable them to pass through unfavorable seasons. For example, during a period of drought or cold the aerial parts of such plants disappear, but with the return of favorable conditions the underground parts rapidly send new leaves or shoots to the surface. The underground structures are known variously as bulbs, corms, rootstocks etc. Not only does the geophilous habit serve to bridge over an unfavorable period, but it chiefly enables the plants to develop its working parts with great rapidity during the favorable season. This is a favorite habit with the so-called spring flowers, which usually grow in ravines or forests. These spring-plants must do their work between the first coming of spring-conditions and the coming of the shade produced by the forest foliage. Their working-season, therefore, is very short, and such plants appear above the ground with great rapidity, and their leaves and flowers are to be seen on every hand while the trees are only coming into foliage. The same result is seen when such plants live in dry regions, where the wet season is very short, and where the underground structures enable such plants to do all their work within a few weeks.

George I, son of Ernest Augustus, elector of Hannover, and great-grandson of James I of England, was born at Hannover, May 28, 1660. Immediately after the death of Queen Anne in 1714, he was proclaimed king of Great Britain and Ireland. Several risings on the part of the partisans of the Stuarts were put down in the early part of his reign. The king's personal part in the reign was slight, Sir Robert Walpole being the actual ruler. He was simply a figurehead and did little harm, mainly because of his lack of ability. He died on June 10, 1727. In this reign occurred the rise and fall of the celebrated South Sea Company. See histories of England by Stanhope, Hallam and Lecky.

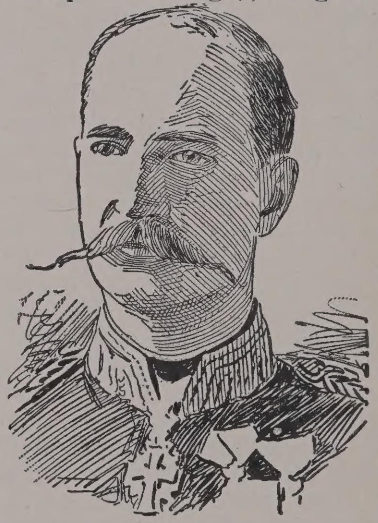
George II was born on Oct. 10, 1683, and succeeded his father as elector of Hannover and king of Great Britain and of Ireland. Though he interfered more than his father had done in the government, yet the policy pursued during his reign was simply that of his ministers, Walpole and Pitt. During Pitt's rule important wars were fought and much glory gained. Among the memorable victories were that of Clive at Plassey and that of Wolfe at Quebec. George II died on Oct. 26, 1760. See histories of England by Stanhope and Lecky; also Thackeray's *History of the Four Georges* and McCarthy's.

George III was born at London, June 4, 1738, and ascended the English throne on the death of his grandfather, George II. Though at the outset very popular, his obstinacy caused him later to lose this popularity, but he regained it in the later years of his reign. He was well-meaning and patriotic, and his long reign of over 60 years was one of the most noteworthy in English history. His obstinacy, however, and the determined spirit of the American colonists lost England the 13 colonies. Notable battles were fought during his reign in America, India and Europe. Great statesmen, such as Chatham, Pitt, Burke and Fox flourished; and great captains, naval and military, such as Nelson and Wellington, made their names immortal. During the last years of his life he was hopelessly insane. He died Jan. 29, 1820.

George V, King of Great Britain and Ireland, was born June 5, 1865, the second son of Albert Edward, Prince of Wales, afterward King Edward VII. He entered the navy as cadet in 1877, passed through the different grades and was promoted to Commander in 1891. He was created Prince of Wales in 1901, after the death of his elder brother. In 1893 he married Princess Victoria Mary, daughter of the Duke of Teck. He succeeded to the throne on the death of his father, Edward VII, May 6, 1910.

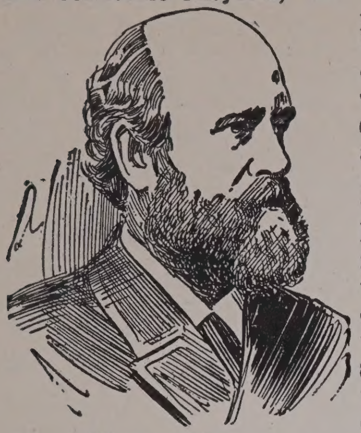
George IV, the oldest son of George III, was born on Aug. 12, 1762. He became prince-regent when his father became insane, and was crowned king of England on his father's death. Little of importance took place during his reign. Besides his many vices and failings, George IV is remembered for his taste for music and literature He died on June 26, 1830. See Thackeray's *History of the Four Georges.*

George I (Christian William Ferdinand Adolphus George), king of Greece, was the second son of the late King Christian IX of Denmark and brother of the dowager-empress of Russia and of Queen Alexandra of England. He was born at Copenhagen, Dec. 24, 1845, and served for some time in the Danish navy. On the abdication, in 1863, of King Otho I of Greece, the vacant throne was offered by the national assembly at Athens to Prince Christian of Denmark, who, accepting the crown, became king of the Hellenes with the title of George I. In 1867 King George married Princess Olga, daughter of Grandduke Constantine of Russia, brother of the late Emperor Alexander II. In 1898 an attempt, which happily failed, was made to assassinate him. On March 18, 1913, he was assassinated by an anarchist while walking in the streets of Salonica. His eldest son succeeded him as Constantine I.



GEORGE I

George, Henry, an American writer on social and economic subjects, was born at Philadelphia, on September 2, 1839. In early youth he was apprenticed on a sailing vessel, and went to California in 1858, where he applied himself to journalism, founding the San Francisco *Post.* In the west he zealously addressed himself to the discussion of public affairs, setting forth his views on land reform in a work entitled *Our Land and Land Policy.* In 1879 appeared his famous work, *Progress and Poverty,* which created widespread and intelligent interest. He returned to the east in 1880 and published a brochure on *The Irish Land-Question,* visited Great Britain, and lectured there and in the United States, discussing the land-question and the economic problems of the time. In 1886 he was a candidate for the mayoralty of New York on the United Labor party's ticket, but was defeated. He founded *The Standard,* which he edited, and also wrote *Social Problems, The Land-Question* and *Protection and Free Trade.* To further his theories, he organized single-tax clubs over the country and addressed them on the special topics in which he was zealously interested. He died in New York, on October 29, 1897.


Henry George

George Junior Republic, The, a republic of boys and girls founded in 1895 by William R. George of New York City, is situated near Freeville, New York. Its purpose is to afford a home, with means of work and education, for homeless or unfortunate children. It is a little community by itself, electing its own officers and legislative assembly after the United States model. At first Mr. George acted as its president, and other adults filled some of the more important offices, but since 1896 all positions have been held by citizens of the republic themselves. The age of entrance is from twelve to eighteen, and children from any part of the United States may be admitted. The trustees control a farm of 240 acres, and the citizens carry on farming, carpentry, printing, dressmaking, and domestic science. Children under sixteen must attend the school of the republic. Every one of the citizens of this busy little nation is required to do some kind of work. Pay is given in aluminum coin, with which alone can the goods of the community be purchased. At the end of the summer this coin is exchangeable for United States money and the young citizens usually show much judgment and self-control both in saving and spending.

George, Lake, also called **Horicon,** a beautiful lake thirty-two miles long, is situated near the eastern border of New York State. It forms the headwaters of Lake Champlain, and is studded with hundreds of picturesque islands. Its shores contain several favorite summer resorts, especially the village of Caldwell, or Lake George. It was the scene of important military operations during the French and Indian Wars of 1755 to 1759, during which time the Battle of Lake George was fought here. This battle is commemorated by a monument. The lake was discovered in 1642 by the Jesuit, Father Jogues. He named it Lac Saint-Sacrament. This name was changed to Lake George in 1775, in honor of King George III.

George, Saint, the patron of chivalry and the protecting saint of England. His history is surrounded by legends. The most probable story is that he was born of noble Christian parents in Cappadocia, became distinguished as a soldier, and, after testifying to his faith before the Emperor Diocletian, was tortured and put to death at Nicomedia, on April 23, 303. Reverence for the sufferer spread through Phœnicia, Palestine and the whole east. Churches were built in his honor, and the Hellespont was called St. George's Arm. A legend describes St. George as slaying a dragon. In 1350 Edward III made him the patron of the Order of the Garter, and in the next century Frederick of Austria founded an order of knighthood called after him. He was much worshiped during the crusades, and was adopted as the soldier-saint who led his votaries to victory. He is also the patron saint of Russia.

Georgetown, capital of British Guiana, in South America, is situated on the right bank of Demerara River, not far from its mouth. The city is beautifully built, with wide streets, some of which are traversed by canals, with bridges at the cross-streets. The principal public edifices are the government-building, the cathedral, Queen's College and a museum and library. There is a short railway to Mahaica and a telephone and telegraph system. There is a good harbor, with a lighthouse and defenses built within recent years. The chief exports are sugar, gold, rum, and balata. The population in 1931 was 62,690.

Georgia, a southern Atlantic state and the last settled of the original thirteen colonies. It has an area of 59,265 squares miles, being as large as England and Wales combined and nearly as large as all the New England States together. It is 320 miles long and 259 wide, and lies between Tennessee and North Carolina on the north; South Carolina and the Atlantic on the east; Florida on the south; and Alabama (with an angle of Florida) on the west.

Surface. The state lies both in the Appalachian and in the coastal-plain region, hence the surface is divided between highlands and lowlands. In the northern section the elevation is between 3,000 and 5,000 feet above the sea-level, the latter height being attained by only a few peaks, the highest of which is Sitting-Bull Mountain, 5,046 feet above the sea. An area of about 6,000 square miles in northern Georgia has an elevation of 1,000 feet or more. The lands bordering directly on the coast are flat and but slightly raised above the sea-level. The Okefenoke swamp in the southern part of the state is forty-five miles long and thirty wide and comprises 400,000 acres. The state is well-drained by rivers of moderate size. Among the larger of these are the Savannah River on the eastern boundary; the Oconee and the Ocmulgee, which form the Altamaha, in the central part of the state; and in the western section the Flint and the Chattahoochee, whose confluence forms the Appalachicola. The coastline is indented by many deep inlets, some of which form excellent harbors. Separated from the mainland by a navigable channel is a chain of islands, some of them quite large, extending along the entire coast.

Climate. Of nine climatic belts found in the United States, eight are represented in Georgia. The lowest, found on the highest mountain peaks, has a mean annual temperature of less than 40°. Nearly all middle Georgia is in a climate-zone of between 60° and 65°, while that of the southern portion of the state ranges from 65° to 70°. The rainfall is greatest in the extreme north and smallest in the eastern part, averaging about fifty inches for the entire state.

Natural Resources. The forest-timbers of Georgia are many and valuable. An area of 16,000 square miles, chiefly in southern Georgia, is covered with forests of the long-leaf pine, while in the central and northern sections are immense forests of hardwoods, oak, hickory, maple and other varieties. In 1931, 459,617,000 feet of lumber were cut. From the pine forests, besides the valuable timber, are produced large quantities of turpentine and rosin, almost equal in value to the timber products. The state is divided into three main geological areas: the Paleozoic region in the northwest; the region of Crystalline rocks comprising the remainder of northern Georgia and continuing through the center of the state; and the coastal-plain region. In the Paleozoic area are found valuable deposits of coal, iron, manganese, roofing-slate and aluminum, while the rocks are mostly sandstones, limestones and shales. In the Crystalline area are found granites, gneisses and schists, while on the border of these two regions are found the marbles for which Georgia is famous in every section of the Union. Many magnificent buildings in every section of the United States are constructed of Georgia marble. Extensive and valuable clay-deposits exist in many parts of the state, 289,880 tons being produced in 1930. These are used in the manufacture of bricks, terra-cotta, tiles, etc., while the finer clays are used for crockery and fine china. Gold, it is claimed, was first discovered in Georgia in Lumpkin County in 1828. The town of Dahlonega, in this county, is still the gold-mining center of the state. The other gold-producing counties are White, Dawson, Cherokee, Carroll, Hall, Gwinnett, Columbia and McDuffie. Other mineral products of the state are coal, iron, silver, copper, pyrite, asbestos, talc, mica, barite and marl. Extensive deposits of yellow ochre, used in the manufacture of paints, are found near Cartersville, in Bartow County. There are a number of fine mineral springs in the state, among them Indian Spring, a sulphur spring in Butts County, and Bowden Lithia Springs in Douglas County. Throughout southern Georgia there are many artesian wells. The total value of mineral products in 1930 was $12,830,845.

Agriculture. Agriculture is the leading industry. Owing to the variety of the climate and soil and the varying altitudes of the different sections, the state produces the greatest variety of crops of any state in the Union. In order of precedence the products of Georgia are cotton, corn, hay and grain, truck, horticulture, dairying and live-stock. In the swampy regions of southern Georgia and in the heavily timbered northern section there is much uncultivated land. Between the two sections lies the cotton-belt.

Georgia is the largest producer of sea-island cotton, although this variety covers less than five per cent of its cotton-growing area. Georgia has ranked second only to Texas in the production of cotton, but fell in 1932 to sixth place. Rice is an important crop in the coast counties, about 8,000,000 bushels being produced annually. Sugar-cane is grown over the middle and southern section, the larger part of the crop being used in the manufacture of syrup. The state ranks first in the production of peaches and watermelons and second in peanuts and sweet-potatoes. Georgia has in its commercial orchards over 16,000,000 peach-trees, whose annual production is valued at over $5,000,000. The famous Elberta peach was originated by Mr. S. H. Rumph at Marshallville, Georgia. Pecans are grown successfully in many sections. Tobacco is largely grown in the southern section of the state. Here is the largest tobacco-farm in the world, embracing 25,000 acres.

In 1932, were produced from 3,856 acres, 38,560 bushels of corn; from twenty-seven acres, 12,501 pounds of tobacco; from 838 acres, 398,050 pounds of peanuts; and from 2,985 acres, 845 bales of cotton.

Manufactures. Georgia, because of her industrial importance, has long been known as the Empire State of the South. A number of conditions favor the growth of manufacturing interests, one of which is the great output of raw material and another the wide distribution of water-power. In the manufacture of bleached cotton-goods Georgia stands fourth in the Union. In 1932 there were 131 cotton-mills. The value of the cotton products amounted to $212,852,000 in 1929. Other important manufactures are lumber factories, printing establishments, flour and grist mills, woolen mills, furniture factories, foundries, car shops, manufactories of brick, tile, and pottery. The state exceeds all others in the manufacture of cotton-gins.

Transportation and Commerce. Georgia has superior transportation-facilities. The chief trade centers are Atlanta, Savannah, Augusta, Macon, Columbus and Brunswick. Atlanta is at the junction of the streams of commerce from the northeast, the north and west. Augusta, Macon and Columbus are all situated at the head of steam-boat navigation in the rivers on which they are located. Savannah and Brunswick are the chief seaports of the state. Railway construction dates from 1833 when the Central of Georgia was built from Savannah to Macon. There now are 6,672 miles of steam railroad and 425 miles of electric railway connecting the important cities and towns, and the rates of transportation are regulated by law. Of the 7,131 miles of state highways, 4,067 are surfaced.

Education. The public school system was established in 1870, and provides for instruction in the elementary branches at public expense for children between six and eighteen years of age. The white and colored children are taught in separate schools. There is a board of education consisting of five members—the governor, the secretary of state, the attorney-general, the comptroller-general and the state school-commissioner. The last is the executive officer of the board. There is in each county a board of education, consisting of five members, elected by the grand jury, and a county school-commissioner, who supervises the county-schools and is elected by the county-board. In the cities and larger towns and in some counties the schools are operated under local laws, which provide for local taxation for schools. The total expenditure for education in 1932 was $18,235,248, exclusive of normal schools. In 1932 there were 6,464 elementary schools with an enrollment of 642,482 pupils and 15,846 teachers; and 1,555 public high schools, with 100,274 pupils and 3,778 teachers. In recent years there have been quite an awakened interest in education and much improvement in school-houses and school work. The towns and cities and many rural communities maintain high-schools, and there are many excellent private preparatory schools.

The state university, established in 1785, is located at Athens. On the campus are located the following schools: Franklin College, State College of Agriculture and Mechanic Arts, State Law School and the College of Pharmacy. The following institutions also are branches of the university: The State Normal at Athens; the Georgia Normal and Industrial College at Milledgeville; the School of Technology at Atlanta; the North Georgia Agricultural College at Dahlonega; the Georgia Medical College at Augusta; and the Georgia Normal and Industrial College for Colored Youths at Savannah; also eleven district Agricultural High-Schools.

Emory University, located at Emory University, Georgia, was chartered in 1836, and is the property of the Methodist church. Mercer University, a Baptist college, is located at Macon, and was chartered in 1836. Wesleyan Female College, situated at Macon and belonging to the Methodist church, has the distinction of being the first female college in the world to confer degrees upon its graduates. Other important colleges are Shorter College at Rome; La Grange Female College at La Grange; Bessie Tift College at Forsyth; Southern Female College at College Park; Brenau College at Gainesville; Agnes Scott at Decatur; Lucy Cobb Institute at Athens. For colored students there are Atlanta University, Clark University, Atlanta Baptist College, Morris Brown College and Spellman Seminary, all in Atlanta.

History. Georgia, named in honor of George II of England, was founded by James Oglethorpe, an Englishman, who landed at Savannah in 1733. At that time the territory was occupied by the Cherokee Indians in the north and by the Creeks or Muscogees in the central and southern portions. With these tribes Oglethorpe established friendly relations. For twenty-one years Georgia existed under a colonial government. Georgia originally extended to the Mississippi, and until 1802 included the territory now embraced by Alabama and Mississippi. Under the laws of the colony the introduction of rum and slaves was forbidden, and slavery was not introduced until 1749. In 1754 Georgia became a royal province, continuing such until the Revolution. In that struggle for freedom Georgia took an active part. Her representatives signed the Declaration of Independence, and on her soil some of the most important battles were fought. After the Revolution Georgia's increase in wealth and population was rapid. In 1802 the Creek Indians ceded the greater part of their lands to the United States, and in 1838 the Cherokees were removed to Indian Territory, thus increasing the land belonging to the State. In 1861 Georgia seceded from the Union. During the Civil War she furnished not less than 80,000 soldiers to the Confederate armies, and a large part of the gunpowder used by the southern troops was made in Augusta. During the war Georgia bore more than her share of misfortune. Great commercial depression was followed by actual deprivation. At the end of the war it was estimated that four-fifths of the public wealth had been destroyed. In 1865 Georgia was placed under military rule, and its affairs were administered by a provisional government until 1870, when it was readmitted to the Union by act of Congress. The population of Georgia, in 1930, was 2,908,506.

Georgia, also known as the **Georgian Socialist Soviet Republic**, was formerly a province of Russia, and is now one of the three Transcaucasian republics established after the Russian Revolution of 1917. A Social Democratic government established in 1918 was replaced by a Soviet government in 1921, which in 1922 united with Armenia and Azerbaijan to form the Transcaucasian Socialist Federated Soviet Republic, affiliated with the Union of Soviet Socialist Republics. Georgia is bounded on the north by the Caucasus, on the east by Azerbaijan, and on the south and southwest by Armenia and Turkey. It extends over an area of 26,381 square miles.

Agriculture is the principal occupation, engaging ninety per cent of the people. Corn, the vine, and fruits are the chief agricultural products. Silk production and bee-keeping have flourished for years. There are around Tchiaturi the greatest deposits of manganese to be found anywhere in the world, and coal, naptha, copper ore, lead and iron ore are also obtained in Georgia. There are valuable forests. Under the Soviet rule, all of the basic industries are nationalized and the manganese, timber, tobacco, silk and copper are used for exchange in foreign markets.

Georgia has excellent communication facilities. There are 570 miles of railways, including a through line connecting Batum and Poti on the Black Sea with Baku on the Caspian, by way of Tiflis. There are branch lines to the chief cities, the Armenian frontier, and to the coal mines of Tkhibuli, the manganese mines of Chiaturi, the mineral springs of Borjom. By way of Batum, there is good communication with the whole of the Caspian country, as well as Asia Minor and Central Asia. The population is 2,660,963. Tiflis, the capital, has a population of 294,000.

Georgia, University of, which received its charter in 1785, in certain respects is an instance of French influence upon American universities. The French idea of a university from the time of Diderot to the present has been that of a comprehensive national institution including primary schools, secondary schools and the university proper. The best example of an attempt at a university of this type in America, next to Jefferson's original scheme for a University of Virginia, is the University of the State of New York. Georgia University, in the French spirit, includes not only the university proper, known as Franklin College, but the following attached institutions: The State College of Agriculture, The Law School, The Graduate School, The Medical College, The North-Georgia Agricultural College, The State Normal School, The Normal and Industrial School for Girls, The School of Technology and the Industrial College for Colored People. These institutions, although centralized in the University of Georgia, are in different towns.

Georgian Bay, an eastern extension of Lake Huron, is situated south of Algoma district, Ontario, and west of Parry Sound and Muskoka district. Bruce Peninsula forms a part of its western shore. The C. P. R. steamers westward bound (for Port Arthur) leave Collingwood, which is at the southern angle of the bay. Manitoulin Island forms part of its western boundary.

It contains thousands of islands. The bay is entered by a channel twenty miles wide, south of Grand Manitoulin, the largest island.

Geotropism (*jê-ŏt'rô-pĭz'm*), is the sensitiveness of plants to the action of the earth's gravitation, to which they respond by changing the rate of growth or the turgor of certain regions. This produces a curvature which alters the position of the attached parts with reference to the direction of gravitation. Most plant-parts assume a position, fixed by the time they are mature, which is a resultant of the effect of various external factors, especially of light and gravity. Parts still capable of growth and motor-organs, however, when put in a new position (as when an erect stem is made horizontal), curve so as to bring the parts into the normal position. The parts may be directed toward the earth (primary roots); or away from it (erect stems); or transverse to gravitation at any angle (creeping and underground stems and lateral roots).

Geranium, the name in botany of one kind of plants and in popular language of another. The plants known in botany as geraniums are also called cranebills, and the genus includes nearly two hundred species, widely distributed in temperate regions. About seventy species are found in the United States. The largest and best known is the spotted cranebill. Its stem is about two feet high, and each of its numerous branches bears two light purple flowers about an inch across. The root-stock is very bitter, is used as medicine, and is also called alum-root. The herb Robert is also a beautiful plant common in our woods, noted for its small flowers, prettily striped and rosy. The plants commonly called geraniums are also known in botany by the name pelargoniums. They are very popular for window-culture, summer bedding-plants and the greenhouse. Many kinds have come from the Cape of Good Hope and some from Australia. The best known is the rose-geranium, which was brought to England in 1690. Other varieties are the peppermint-geranium and fish-geraniums, whose flowers range from white to the most dazzling scarlet and dark crimson.

Gerard (*zhā-rär'*), **Baron François Pascal,** a noted painter, was born of French parents at Rome, on March 11, 1770. When young he was brought to France and became a pupil of the celebrated painter, David. His work soon brought him into notice, and he became known as the painter of kings. Among the famous people whose portraits he painted are Napoleon, the Queen of Naples and Talleyrand. He was made first court-painter and raised to the rank of baron by Louis XVIII. The grandest of his works are historical pictures, as the *Battle of Austerlĭtz.* He died at Paris on January 11, 1837.

Gerhardt (*gĕr'härt*), **Paul,** one of the best writers of hymns in the German Lutheran church, was born in Saxony, on March 12, 1607. He became dean at the church of St. Nicholas in Berlin in 1657, but was banished from Brandenburg in 1666, for his opposition to the attempt to unite the Lutheran and Reformed churches. He wrote 123 hymns, all excellent. Many of them are well-known by translations. *Now all the Woods are Sleeping* is one of his most tender lyrics. He died on June 6, 1676.

German East Africa, previously the largest of Germany's colonies, passed under British control in December, 1917, as the result of the invasion which began in 1914. It is bounded on the north by Uganda, on the northeast by British East Africa, on the east by the Indian Ocean, on the south by Portuguese East Africa, on the southwest by Nyasaland (formerly the Central Africa Protectorate) and on the west by Lakes Nyasa and Tanganyika and Congo Free State. Its extreme length is 725 miles, its greatest breadth nearly 625 miles, and its area of 384,000 square miles equals Arizona, California and Nevada together. Its sea-coast extends 620 miles, and inland it borders Lakes Nyasa, Tanganyika and Victoria, the most valuable lakes on the continent. The climate is tropical, but the uplands are inhabitable for Europeans. The native population is approximately 5,000,000, mainly tribes of mixed Bantu race, with over 10,000 Arabs, Goanese, Hindus and Syrians near the coast. The country produces almost every tropical fruit, cacao, coffee, cinchona, fibers, sugar, tea, rubber, tobacco, vanilla, maize. Coal, copper, gold, iron, lead, mica, precious stones and salt have been found here. Garnets abound in large quantities. Large forests of mangrove, palm and tamarind spread along the coast, while acacias, cotton trees and sycamores cover the higher areas. The government maintains forests along the coast and also operates experiment stations for stock breeding and tropical culture. The natives in the more settled regions pursue agriculture, some of them cultivating large banana-plantations, and near the coast there were many German estates at one time. The principal imports of the country are cottons, rice provisions, hardware and iron. The chief exports are rubber, copra, ivory, vegetable fibers and insect wax. The capital is Dar-es-Salaam, which is also the principal port.

It was the Arabs, subjects of the Sultan of Zanzibar, who, about 1830, first penetrated and laid claim to this part of "Darkest Africa." In 1884, however, three young Germans secretly made their way into the interior and began a series of treaties with native chieftains granting control of territory to Germany. On the strength of these treaties, Germany proceeded to take possession, and the Sultan of Zanzibar was forced to acquiesce. Germany had no sooner taken possession, however, than her methods, which included virtual enslavement of the inhabitants through enforced labor on plantations, resulted in a series of revolts which were not ended until 1906, the conclusion of a war in which 120,000 natives—men, women and children—were killed.

As a result of steady attack by British forces during the World War, the Germans were pushed southward and towards the close of 1916 all territory north of the Rufiji River was in the hands of the Allies. By the close of 1917 the entire country was free from German domination. Since 1919 Belgium has held the mandate for the western provinces of Urundi and Ruanda of which Usumburu is the capital. This mandate has been administered as a part of the Belgian Congo since 1925. Just south of the Rovuma on the coast a small area is administered as part of Portuguese East Africa. The remainder of German East Africa is known as Tanganyika Territory, and held under mandate by Great Britain. This mandate extends from the Umba River on the north to the Rovuma on the south and includes the adjacent islands.

Germany, a republic of central Europe, which prior to the defeat of the German armies in 1918 was a constitutional monarchy consisting of twenty-five federated states and one imperial province (the reichsland of Alsace-Lorraine). Its total area at that time was 208,780 square miles. The population was estimated at 67,812,000. As a result of the World War, Germany became a republic on November 9, 1918. Its Constitution was adopted on July 31, 1919. The country forfeited approximately 27,275 square miles of territory and about 6,471,581 of its total population. To-day Germany extends over an area of 185,889 square miles (exclusive of the Saar Basin). Its total population in 1933 was estimated at 65,300,000.

Surface and Drainage. The central and southern parts of the country are occupied by a range of high tableland, broken by mountain ranges and groups, such as the Harz in the north, the Taunus in the middle and the Black Forest and Bavarian Alps further south. The Zugspitz in Bavaria, the highest peak in Germany, is 9,665 feet in height; the Vosges reach 4,700 feet; the Felberg in the Black Forest 4,903; and the famous Brocken 3,740. From the center of the empire north to the German Ocean stretches a vast, sandy plain, broken only by two terrace-like elevations, with an average height of about 600 feet, one near the coast of the Baltic and the other running from Silesia into Hannover.

The country is divided into three drainage-basins. The Danube, with its tributaries, drains the greater part of Bavaria into the Black Sea. By far the greater part of the country has a northern slope. The main streams emptying into the North Sea are the Rhine, the Weser and the Elbe, with their branches. Into the Baltic flow the Oder, the Vistula, the Memel and the Pregel. Numerous canals also connect the great river-systems. The chief are Ludwig's Canal (110 miles long) in Bavaria, which, by uniting the Danube and the Main, connects the Black Sea and the German Ocean; the Finow Canal (40 miles) in Brandenburg; the Kiel and Eider Canal (21 miles), uniting the Baltic with the German Ocean. The North

Sea and Baltic Canal (the Kaiser Wilhelm Canal) is sixty-one miles in length from the mouth of the Elbe to Kiel, and is designed mainly for war-ships. There are many small lakes; and swamp-lands and marshes are abundant.

Minerals. The mineral products are rich and varied, and furnish one of the chief industries. Prussia has the chief mining centers—coal and iron in Silesia, Westphalia and Rhenish Prussia, silver and copper in the upper Harz and zinc in Silesia. Silesia has the largest coal-field in Europe, and Prussia yields nearly half of all the world's zinc. The country is rich in clays of all kinds, and the porcelain of Meissen, the pottery of Thuringia and the glass of Silesia and Bavaria are celebrated. The mineral springs have been famous from the earliest ages.

Labor. The new German Labor Code was made public on January 16. It will become effective on May 1. The new law, although it does not destroy private initiative in industry, does subject all business and industry to Nazi supervision. The code provides for the organization of a Confidential Council for the purpose of offering advice to industry on how to efficiently conduct business. The members of the Council will be chosen in March of each year by the "leader employers" (each employer maintaining an organization with more than twenty employés will be termed a "leader employer" in the future) and the leader of the Nazi cell organization. The Labor Code also provides for a group known as Trustees of Labor, appointed directly by Adolf Hitler. The jurisdiction of these trustees will extend over geographical districts in which it will be their duty to maintain industrial peace between employer and employé, to investigate the measures enacted by the Confidential Council and to determine the fixing of wages.

The code further provides for a Courts of Social Honor, where all breaches of social honor by either employer or employê will be dealt with by the chairman who is to be a legal official. The court itself is to be composed of the chairman, an employer and a "confidential man," the latter to be selected from lists compiled by the Labor Front, an organization in which all former trade union members have been combined.

A new plan has been developed by the Nazi government to subordinate German industry and trade to the Nazi state. The details of this plan were disclosed by Kurt Schmitt, Minister of Economics, on March 13, who declared that henceforth the entire industrial system will be of the state, for the state and by the state, or the Nazis. Under the new system of operation, Minister Schmitt is empowered to eliminate, merge or dissolve any business or industrial organization that he so desires if by so doing he will be extending Nazi ideals to all industry.

German industry will be divided into twelve major groups, independent of state boundaries. Philip Kessler, chairman of the Reichs' Electrical Federation, will be chief in command over these twelve groups. The twelve divisions of industry are: mining; machinery; metal production; stone; wood and glass; chemicals; oils and paper; leather and textiles; food products; handicrafts; commerce; banking; insurance, and transportation.

On March 21, the Hitler government launched a project aimed at restoring industrial prosperity throughout Germany. The project embraces many phases of public improvements which will return countless numbers of unemployed Germans to work at jobs created by the Hitler government. New automobile highways are to be constructed, administration buildings and office buildings for Nazi leaders will be erected, a new bridge will span the Rhine and railways will be electrified as a part of the extensive public works program being put under way by the Nazi government.

A vast project which was begun several years ago was put into service on March 21. This completed project is the Niederfinow "water lift," the largest of its kind in the world. Traffic through the Hohenzollern canal will be greatly increased by this feat of modern engineering. The new lift replaces four old locks through which barges and ships are transferred from the Oder river to the Hohenzollern canal. The time of transference has been reduced from two hours to twenty minutes.

Trade. A German-Polish Trade Treaty was concluded between the two nations on March 8, which terminated the tariff hostilities that had existed between Germany and Poland for more than eight years. The treaty had been preceded by a ten-year non-aggression pact which was signed on January 26.

Under the terms of the treaty, which became effective on March 15, Germany agreed to discontinue a maximum tariff schedule towards Poland and to allow 42,000,000 tons of ironware and 2,400 tons of steel from Poland to enter Germany annually. It also provides for a fixed quota of scrap iron for the mills of Upper Silesia and permits the transit of live stock and products from Poland. Poland, on the other hand, agreed to no longer apply maximum tariffs on ports and embargoes on German merchandise. The pact is expected to greatly stimulate trade between Germany and Poland which had decreased from 750,000,000 marks in 1924 to 110,000,000 marks in 1933. The protocol, not a commercial treaty, was signed in Warsaw.

The German-Polish Pact has not been greeted with enthusiasm by other European nations, Rumania in particular, since it is believed that such action on the part of Poland only serves to strengthen the position of Germany and weaken that of France. Poland has been deeply criticized for concluding such an agreement at a time when the preservation of the present European borders is uppermost in the mind of all nations.

A Soviet-German Agreement was concluded

recently which will regulate financial and economic problems between the two countries. The details of the agreement have not as yet been made public, but it is assumed that the debt issue has been settled. Since 1932, Germany's foreign trade has been stagnating, while colossal efforts have been put forth at home to stimulate industry, all at the expense of public funds. Germany's trade with Russia has been particularly affected by the political disturbances created by Hitlerism and it has become quite evident that Germany can no longer depend upon Russia as an export market to adjust its unfavorable trade balance. Germany, unlike other countries, is in no position at the present time to offer Russia long-term credits. The incapacity of Germany to pay its foreign commercial debts has prevented the conclusion of any favorable trade agreements with foreign nations and will undoubtedly be an extremely important point for consideration by the foreign creditor's conference which convenes in April. This inability of Germany to pay its commercial debts will also have great bearing on the negotiations by which Germany hopes to obtain 500,000,000 marks' worth of raw material credit from the American public.

Government. The position of emperor of Germany was hereditary. There were two legislative bodies: the *bundesrat* or federal council, the members of which were annually appointed by the governments of the various states; and the *reichstag* or national representatives, the members of which were elected by general ballot for a period of five years. Acting under the direction of the chancellor of the empire, the bundesrat, besides enacting laws, acted as a supreme consulting and governing board, and had standing committees—for the army, navy, trade, foreign affairs, railroads, etc. Members had the right to be present at the deliberations of the *reichstag*. It was called together every year, but could not assemble unless the other house was also in session. Its proceedings were public; the members were paid and enjoyed certain privileges; and it elected its own president. All laws required the assent of the emperor. The emperor, with consent of the *bundesrat*, could declare war, make peace, enter into treaties with foreign nations and appoint and receive ambassadors. But if the territory of the empire was attacked, he could act independently in declaring war.

It was on January 30, 1934 that the German Reichstag took its first steps in the problem of constitutional reform. The sovereign power of individual states was transferred to the Reich Government. Local Diets were deprived of legislative power. States rights were abolished in Germany and the task of forming a new constitution to replace the Weimar Federal Constitution was begun. Thus did Hitler strengthen his control over 62,410,619 inhabitants.

On March 23, Chancellor Hitler announced his extension of the basis of centralized government to provincial provinces which, in the future, will be brought under the rule of the Reich. Those governors of German states who were appointed to their positions by the National Socialist régime, will in the future, act as direct representatives of the Central Government. Such governors, known as *Reichstaathälter*, were originally representatives of states within the Reich Government. Under the new order the *Reichstaathälter* are direct representatives of the National Minister of the Interior, Dr. Wilhelm Frick. According to Chancellor Hitler, these governors primarily represent the sovereignty of the National Socialist idea. It has been pointed out that no interference with economic or financial policies by either local or party authorities will be tolerated by the Reich Government.

Defense. For sixteen years Germany has been demanding equality of armaments. German militarists have deeply resented the denial of such equality which, they argue, places Germany in the rank of a second-class nation. The demand for arms and rearmament has become an important issue in the Hitler régime. Germany's most strenuous opponent and most deadly enemy upon this issue is France. The French republic demands that rearmament of Germany be confined within narrow limits, that Storm Troopers be abolished and "that rigid permanent control be instituted." The stand of the French Republic on the Disarmament question is based upon a belief that should Germany be granted equality of armaments, the result would be but another victory for the *Gleichberechtigung*, or revision of the Versailles Treaty, by the Reich.

On February 20, Chancellor Hitler conferred with the British envoy, Captain Anthony Eden, at the British Embassy in Berlin. The purpose of Captain Eden's visit to Berlin, as well as to Paris and Rome, was to explain the British Draft Memorandum which was announced on February 1, and to urge the nations in question to accept the memorandum as an effective scheme to meet the demands of Germany for "defensive equality" and still provide a "general European system of security." Captain Eden's visit to Berlin was believed not to have been in vain for Chancellor Hitler, Foreign Minister von Neurath and Propaganda Minister Joseph Goebbels, agreed to consider the Draft and particularly to modify Germany's recent stand of February 3, her reply to the proposals of France on disarmament.

Meanwhile Germany continued rearming. In the 1934 German Budget, which was made public on March 27, a substantial increase was provided for war expenses. The Nazi Storm Troopers were voted a grant of $100,000, a portion of which is to be used for voluntary labor service, a grant which indicates that the Storm Troopers are a permanent party instrument. Military appropriations under the budget include 80,000,000 marks for the army and 108,000,000 for the navy. A grant of 122,190,000 marks has been voted for field aviation purposes, and 50,000,000 marks were provided the aviation ministry for protective measures against air attacks. Germany's activities in constructing automobile highways from Hamburg to Basel, which are being patrolled by Storm Troopers, in rearmament, and the seeming existence of Nazi groups everywhere, have aroused the fears of the entire world of a future attack by Germany.

Church Conflict. The battle being waged by Catholics and Protestants of Germany against Nazi paganism continues. The conflict is one of long standing and as yet neither group has emerged the victor. One of the most important developments in the struggle has been the creation of the Pastors' Emergency League, an organization which was established primarily to defeat the Nazi program of giving politics precedence over religion in Church affairs. The German Christian movement, as the Nazi intervention is termed, fosters ten principles directed chiefly against the Holy Writ and the Creed. The Nazi program advocates the Church condemnation of pacifism; condonation of Storm Troop outrages, and a ruthless application of the "Aryan paragraph." Under the "Aryan paragraph" all pastors with any trace of Jewish blood are barred from the ministry. This paragraph was adopted by the Prussian Church Senate. The German Christian movement also advocates the elimination of the crucifix, the Old Testament and those sections of the New Testament which are considered "superstitious." It is against such paganistic principles that the efforts of the opposition pastors have been directed.

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Adolf Hitler Launches a Public Improvements Project

Chancellor Adolf Hitler addresses a huge throng gathered at the Reichsautrack, near Munchen, on March 21, the day that marked the beginning of a vast public improvements project to relieve unemployment in the Third Reich.

The dissension between Catholics and Nazis is based upon Catholic opposition to Nazi attempts to weaken the Catholic youth organizations by making enrollment in the Hitler Youth Organization compulsory; the Nazi interpretation and application of the Concordat; and the arrest of Catholic priests who dared to voice criticism of Nazi paganism. The Catholic cause has been stoutly defended by Cardinal Faulhaber of Munich, upon whom, on February 27, was conferred the title of "Papal Legate" by Pope Pius XI. The distinguished prelate acquired diplomatic immunity with the title.

In the early part of February, Reichsbishop Müeller, acting in his capacity as Bishop of Prussia, issued an edict which abolished the Prussian Protestant Union. The decree empowers the Reichsbishop to either transfer or retire at will any pastor in the Prussian State. The edict was an attempt on the part of Reichsbishop Müeller to "legalize" the suppression of the opposition pastors and to force the opposing group to surrender. On February 23, however, the Free Evangelical Synod of the Rhineland held session in Barmen and urged upon all pastors continued opposition to the existing church régime and stout defiance of all its decrees. An appeal was also made to congregations to insist upon the retention of their local pastors.

On March 29, Chancellor Hitler issued a demand for peace in church politics. An ultimatum was presented to Reichsbishop Müeller to settle the church difficulties by May 1. Hitler's stand in the conflict was prompted by the intervention of Archbishop Eidem of Sweden whose envoy conveyed a memorandum to Hitler asserting that "Protestants throughout the world regard the persecution and dismissal of opposition pastors as a disgrace to Germany." The displeasure of both President von Hindenburg and Chancellor Hitler with the church conflict has been evident for several months. Early in February it was announced that police protection or aid from governmental agencies would in the future be denied church authorities in the struggle. Whether or no Chancellor Hitler's ultimatum of March 29, will prove effective and end the friction is still doubtful. On Good Friday, March 30, Reichsbishop Müeller appealed to the opposition pastors to surrender to Nazi domination in church affairs. He announced that pastors who have been dismissed must agree to keep out of church politics and pledge "blind subservience" to the Reichsbishop before they could be reinstated and those pastors who were suspended for reasons of state must be dealt with separately. According to Reichsbishop Müeller the church struggle arose from the "bourgeois mentality" of the opposition pastors who, he claims, are lacking in the true

Nazi spirit and unable to understand the state's claim for complete control of church and state. This "bourgeois mentality" must yield to the process of Nazification which is sweeping over Germany, in the opinion of Reichsbishop Müeller, if the conflict is to be ended and peace restored in the church.

History. The Germans first appeared in history when they came in contact with the arms of Rome in 113 B. C. They were not a single nation, but a multitude of separate and independent tribes, connected only by the fact that they were of the same race and language and alike in their mode of life. Many of the tribes became subject to Rome. But in the first few years of our era Arminius led a national revolt, overthrew the Roman, Varus, and slew him and his legions; and about 200 years later the Romans were called upon to defend their own empire against their former subjects. The single tribes now began to form into groups, as the Goths, Franks, Frisians and Saxons, and the invasion of Europe by the Huns forced these races to cross the boundary and overrun the Roman empire. Of the many confederations existing after the breaking up of the Roman empire, the Frankish was the one which formed the kingdom both of France and Germany. The Franco-Merovingian empire in France spread across the Rhine, and with Charlemagne, who was crowned emperor in 800 by the pope, began the long line of emperors and kings who occupied the German throne for more than a thousand years. With his death ended the strength of the vast empire he had reared on the ruins of the Roman power, and in 887 occurred the final separation of Germany and France. At this period there were in Germany five nations: the Franks, Saxons, Bavarians, Swabians and Lorrainers, of whom the Franks were the most powerful; and, after the death of the last of Charlemagne's descendants, the Frankish chief became emperor of Germany in 911. After his death the house of Saxony reigned over the empire for 100 years and was followed by that of Franconia, whose greatest emperor was Henry III (1039-56), who did much to check the insolence of the great German nobles and strengthen the empire. In 1138, with Conrad III, began the so-called Hohenstaufen dynasty, to which belonged the famous Frederick I (1152-90), surnamed Barbarossa "Red Beard." He spent most of his life in wars, and took part in the crusades, in which both he and the flower of chivalry perished. An interval of struggles and foreign wars followed his death, until in 1273 the declining power of the empire was in part revived by Rudolf I, the earliest of the Hapsburg line which still rules in Austria. For the next 200 years the history of the German empire presents few features of interest. During the rule of Sigmund occurred the celebrated council of Constance, in 1414, at which John Huss was condemned to be burned for heresy. Under Maximilian I, Luther began to preach the reformed faith, but it was during the reign of Charles V (1519-56) that this faith was firmly established in Germany. At the same time occurred the Peasants' War, which threatened to undermine the foundations of society. In 1618 began the disastrous Thirty Years' War, the effect of which was to depopulate the rural districts of Germany, destroy its commerce, burden its people with heavy taxes, cripple the already weakened power of the emperors and cut the empire into a multitude of little states, the rulers of which exercised almost absolute power within their own territories. The war of the Spanish Succession (1702-13) brought glory to the German arms through the great victories of Prince Eugene, together with the English general Marlborough, over the French, but brought no solid advantage to the empire. During the Seven Years' War (1756-63), Frederick the Great of Prussia won the name of a skilful general at the expense of the empire.

During the European wars which followed the French Revolution, Germany was almost entirely at the mercy of Napoleon. In 1805 Francis II resigned the German crown, and became emperor of Austria, and the old empire was at an end. After the fall of Napoleon those states which still were independent combined in 1815 to form a German confederation. Of the 300 states into which the empire had once been divided, there remained only thirty-nine, a number afterward reduced to thirty-five. The old *diet* or assembly, which had formerly elected the emperors, was reorganized but failed to satisfy the nation, and in 1848 insurrections of the discontented people broke out, but ended in nothing. Austria and Prussia had long been rivals for the leadership of Germany, and had made the *diet* the arena for their rivalry. In 1866 war broke out between them. The Prussian host of 225,400 men entered Bohemia, and, meeting the Austrian army, 262,400 strong, decisively defeated it in the battle of Sadowa and, pushing on toward Vienna, forced a peace which shut out Austria from a share in the future organization of the German states. The states north of the Main were united with Prussia in what was called the North German Confederation. On July 19, 1870, the long-threatened war between Prussia and France broke out. The southern German states at once decided to support Prussia and the northern states, and placed their armies at the disposal of King William. The Germans were victorious in battle after battle, and pushed on steadily, though with heavy loss, toward Paris. The French emperor, Napoleon III, was defeated at Sedan, surrendered his army of 90,000 men, and was sent as a prisoner into Germany. The Germans laid siege to Paris, which surrendered on Jan. 29, 1871. France was condemned to pay $1,000,000,000; and the province of Alsace, with the German part of Lorraine, was ceded to Germany. But the most important result of the war was to complete the union of the northern and southern states of Germany. The old empire was restored, with the king of Prussia as hereditary emperor, and on Jan. 18, 1871, at Versailles, France, King William was proclaimed emperor of Germany.

Under the skilful leadership of Prince Bismarck, then chancellor, the new empire steadily grew in power and influence. The reign of Emperor William II was noteworthy for the extraordinary development of industrial Germany, coinciding with increasingly active participation in what the Germans called "world politics." From a loose confederacy of weak states Germany was transformed into one of the world's great powers. The German army became the greatest military machine on earth, and the navy was outclassed only by the British. Germany acquired colonies in all parts of the world, and became a leading factor in all problems affecting the Balkans and the Far East. In the Balkans pressure from Berlin was steadily exerted on Austria to preserve and strengthen the Austro-German corridor, through alliance with Turkey, into Asia Minor. A nation so aggressively imperialistic necessarily collided with other imperialistic powers. The collision was the World War, started by the spark of assassination, but really caused by the new power of modern Germany (See WORLD WAR).

Defeat in the World War was followed by revolution, exile of the Emperor and the Crown Prince, followed by a republic, which had to face not only the onerous conditions of the Treaty of Versailles, with their attendant economic disorder, but royalist and radical intrigue.

On January 30, 1933, the Chancellorship of Germany was assumed by Adolf Hitler. One year later we find German industry, trade, religion, society, education and the press subordinated to the Nazi state. It must not be supposed, however, that Hitlerism has in any sense supplanted the old régime in Germany. It has but supplied an interregnum of National Socialism. The National Socialist German Labor Party, commonly known as the Nazis, has enjoyed an existence of fourteen years, a period during which it has undergone several reorganizations. Adolf Hitler founded the Nazis, an anti-Semitic group which is strongly opposed to the Social Democrats and Republican Constitution of the Reich, on February 25, 1920, in Munich. Hitler, a capable and magnetic orator, found an eager and willing group of listeners awaiting him during the economic chaos into which Germany and the rest of the world was hurled in 1929. The astounding growth of the Nazis may be clearly seen by comparing their representation in the Reichstag in 1928 with that of 1933. On May 20, 1928, the Nazis amassed a popular vote of 809,541 and gained twelve seats in the Reich. On March 5, 1933, the party won a popular vote of 17,269,629 and gained 288 seats in the Reich, giving the Nazis an absolute majority in the Reichstag. Since the advent of Hitlerism, a spirit of exaggerated Germanism has invaded the country which has worked towards the suppression of the Jew, the repression of all individuality, of every thought or action indicative of questionable infidelity to Hitler and the Nazi program. The final aim of Nazism, according to Chancellor Hitler, is "a greater, better, happier Germany; one people, one state, and one church."

On February 14, 1934, the Reich Representation of German Jews was organized aiming at uniting the Jews in Germany. Several prominent Jewish leaders sat in the council. An appeal was made to fellow Jews to "bury internal dissensions and unite. All the forces of German Jewry should serve one aim and to secure for every Jew in the Fatherland not only living space but also liberty to profess and practice his Jewish faith openly and unrestrictedly." Despite the formation of the union of Jews, Nazification of professions and industry continues throughout Germany and restrictions are still enforced against the Jew. On March 5, Dr. Goebbels, Nazi Minister for National Enlightenment and Propaganda, announced a new regulation which henceforth bars all non-Aryans from the German theatre. The privilege of acting on the German stage is reserved to members of the German Theatre Chamber, an organization in which non-Aryans are denied membership.

Upon the death of President von Hindenburg on August 2, 1934, Chancellor Hitler assumed the duties, although he refrained from using the title, of the Presidential office.

German Language, The, is closely related to English, Flemish and Frisian, forming with these the western Teutonic group of languages. Literary German is essentially the High German rather than the Low German dialect. Old High German dates from the eighth century to the beginning of the twelfth; Middle High German thence to the beginning of the 16th century; and Modern German from the Renaissance to the present time. It is commonly said that Luther was the founder of modern literary German; but, if one may trust his own statement, he merely adopted the official language of the imperial chancery and the imperial court. In this language the Middle High German vowels, long *i*, long *u* and *ü*, had given place to the diphthongs *ei*, *au* and *eu*. Luther says (*Table-Talk*, ch. LXIX): "I have no particular language of my own in Germany, but use the common German language, so that both High and Low Germans may understand me. I follow the language of the Saxon chancery, which all the princes and kings of Germany take as their model; all the free imperial cities and all the courts of princes write according to the chancery of the Saxons and of our prince. Hence it is the most common German language." Certainly, however, Luther's writings and especially his translation of the Bible did much to fix the form of modern literary German. The old German empire indeed was so divided in its politics, history and religion that modern German has only enjoyed a fixed literary form since Lessing and other pioneers in the middle of the 18th century.

German Oceania comprised the northern section of eastern New Guinea or Kaiser Wilhelm's Land, with islands off its coast; Bismarck Archipelago; part of the Solomon Islands; the Eastern Carolines, of which 32 out of 88 were German; the Western Carolines; the Pelew Islands, 11 out of 56 being German; and the Marianne Islands, seven out of 58 of which were German; the Marshall Islands; and Savaii and Upolu, the two largest of the Samoan or Navigator Archipelago. All came into British possession by conquest as a result of the World War (*q. v.*).

German Southwest Africa is bounded on the north by Portuguese West Africa; on the east by Rhodesia and the Bechuana countries; on the south by Cape Colony; and on the west by the Atlantic, with the exception of Walfish Bay, about midway the coast, which belongs to Cape Colony. It contains 322,450 square miles, with a population of 100,000. Prior to the World War (*q. v.*) the coast was held by the German Colonial Company for Southwest Africa, with the seat of administration at Windhoek. The territory is divided into Damaraland on the north and Namaland on the south. The barrenness of the east and south is being somewhat successfully relieved by artesian-well irrigation. A new harbor has been built at Swakopmund, a narrow-gauge railway connects this port with the capital, windhoek, 237 miles inland and another runs from Swakopmund to Tsumeb (359 miles). Swakopmund, Karibib, Okahandja and Windhoek are connected both by telegraph and telephone. There is a cable to Europe. Agriculture is practiced chiefly in the form of market-gardening, but there are extensive pastoral interests. The imports are chiefly provisions, textiles and iron-manufactures; the exports chiefly animals on the hoof, guano and animal-products. Copper is mined, and diamonds and gold have been found. Southwest Africa, together with all her other colonies, were lost to Germany as a result of the World War (*q.v.*), her possessions in Africa, as well as in the South Pacific, passing into the hands of England; the conquest, in both cases, being effected by the colonial forces of Great Britain —in Africa by the Boers.

Germantown, a famous town of Pennsylvania, included since 1854 in the limits of Philadelphia. It was the scene of the defeat of the American army under Washington by the British on Oct. 4, 1777. Washington had learned that Howe had separated a portion of the main division of his army, then at Germantown, and he determined to take advantage of it to attack his camp. Marching all night, he attacked the enemy at sunrise, but the morning was dark and foggy, and the Americans were thrown into confusion. They were seized with panic, though Washington succeeded in retreating in good order. The Americans lost 1,000 men, and the British 600.

German Universities take high rank. Heidelberg, the earliest, was founded in 1386, and there are 21 universities with 3,203 professors and teachers and 44,964 students. Berlin (6,569 students), Leipsic (4,147) and Munich (5,734) are the largest universities; and Greifswald (890) and Rostock (661) the smallest. Of the universities 14 are Protestant, four are Roman Catholic and three are mixed. The government has control over these institutions, and the ministers of public instruction have the immediate charge; and all except three are dependent upon state-appropriations. The ministers of public instruction appoint for each university a curator, who sees that the regulations and laws are enforced. The professors choose a rector, who is the actual head of the university, sometimes a prorector when the sovereign is the nominal rector; and a judge to assist the rector and the deans of the faculties; and a questor, who collects and pays over the fees due from students There is, besides, a senate composed of these officers, which is called together to decide on important matters. All the universities have the four faculties or branches of philosophy, jurisprudence, medicine and theology, and some add those of political economy and natural science. Entrance to the universities can be made only through the gymnasium or preparatory school, except in the case of foreigners, who are admitted without examination. Students are not obliged to stay in one university, but can study at several, and can enroll themselves in whatever branch they desire to work at. They board and lodge where they please, and enjoy much social liberty. The instruction is by lectures. If a student is expelled from one university he is expelled from all. The course of study is one of four years, except in the medical faculty, which in some institutions is five years.

Germina'tion, the process by which a spore develops a young plantlet. There are certain conditions of germination which are well understood. For example, the spore must have a certain amount of food-material in solution, of heat and of air (that is oxygen). Spores differ widely from one another in the amount of heat necessary for germination, some spores being able to germinate in temperatures which would be impossible in others. The word germination, however, is constantly applied in a popular way to the results which follow the planting of seeds, although this process is not really germination. When a seed germinates, the process does not consist in the formation of a new plant, but in the escape from the seed of a plant which has already been formed. Real germination is the formation of new plants by spores; while the germination of seeds is merely the escape of the new plant from the seed case. However, the conditions which favor the germination of spores are also the conditions which favor the so-called germination of seeds.

Germ Theory of Disease is the theory that most diseases are due to germs or bacteria growing within the body and that a particular kind of microscopic organism is always associated with a particular disease. This has been demonstrated for a considerable number of diseases, as splenic fever, tuberculosis, cholera, diphtheria and others, but clear proof is wanting in regard to many other diseases. Although the connection between disease and microscopic germs had been surmised by a few individuals in the 18th century, it was demonstrated only in the latter half of the 19th century. The names of Pasteur, Lister and, especially, Koch are associated with the establishment of the theory. Pasteur as early as 1857 demonstrated a connection between microscopic organisms and diseases of silkworms. He was guided and assisted in his conclusions by the previous work of Latour and Bassi. Koch in 1877 showed the connection between minute thread-like organisms and splenic fever. Then followed, in 1882, his discovery of the disease-germ of consumption and, in 1884, of cholera. Lister, the English surgeon, showed the immense importance of getting rid of all germs and keeping them away during surgical operations, and this led to antiseptic surgery. Although very minute, the bacteria can be distinguished under the microscope. There are usually several kinds mixed together — some harmless and some harmful. They are separated in a very ingenious manner, being thoroughly mixed in melted or dissolved gelatine, which is then flooded in a thin layer over a sterilized plate. They grow and feed on the gelatine, the different kinds being isolated and held in place by the thickening of the gelatine. In this way a pure culture is obtained. The necessary chain of evidence laid down by Koch for proving the connection of particular organisms with disease is as follows: First, the micro-organism must be found in the fluids and tissues of the diseased subject. Second, this organism must be isolated and cultivated outside the animal's body. Third, a pure culture thus obtained, when injected into the body of a healthy animal, must produce the disease in question. Finally, the same micro-organism must be found abundantly in the fluids and tissues of the inoculated animal. Not all diseases are due to bacteria. Malaria, for example, is due to a minute animal-organism which enters the red blood-corpuscles and develops within them. The particular germ or organism of many diseases has not been determined. The bacteria of a particular disease get into the human body and multiply. Sometimes they are eaten by the white blood-corpuscles, or their growth is limited by unfavorable conditions. Under other conditions they multiply rapidly and invade the tissues, producing the particular disease with which they are always associated. After once having had a contagious disease, one is usually free from another attack. Various explanations have been suggested. It has been suggested, for example, that during the disease certain chemical substances are manufactured and retained in the body that are harmful to that particular organism. It is said, further, that the white blood-corpuscles, which are known to be eaters of bacteria, are better able to cope with a second attack. It is also suggested that the body becomes acclimatized to the poison produced by the bacteria, just as it can become accustomed to tobacco and other poisons. It is to be understood that these are merely theoretical explanations. See Prudden: *The Story of the Bacteria and Their Relations to Health and Disease.*

Gérôme (*zhā'rōm'*), **Leon,** a French painter, was born at Vesoul, May 11, 1824. After studying at Paris and traveling in the east, he was appointed professor of painting in the school of Fine Arts at Paris. His reputation was raised to the highest pitch by his *Roman Gladiators in the Amphitheatre.* Among the best known of his works are *Phryne before Her Judges, Cleopatra and Cæsar* and *Lioness meeting a Jaguar.* Many of his works have become widely known by photographic copies. See Stranahan's *History of French Painting.* He died on Jan. 10, 1904.

Gerry, Elbridge, an American statesman of the period of the Revolution and one of the signers of the Declaration of Independence, was born at Marblehead, Mass., in 1744, and died in 1814. He was one of the prime leaders of the opposition in America to British interference, and was closely allied with Samuel Adams in the politics of Massachusetts. On the eve of the battle of Lexington he escaped half-dressed from the British soldiery. It was Gerry who laid the foundation of an American navy, and at the same time suggested the waging of offensive war against England, by a bill in 1775 to fit out vessels against the British vessels and navy. Gerry acted with dignity and severity in the continental congress. He disliked and refused to sign the draft-constitution of the United States; but was elected a member of the first congress. He was re-elected to Congress in 1791. He was envoy to France in 1797; but the embassy was badly received, and was deceived by Talleyrand. In 1810 Gerry was elected governor of Massachusetts, and in 1812 he became vice-president of the United States. As governor he agreed to a bill which changed the districts of the state in such a way as to give a greater number of majorities to his own party. This was the origin of the term *gerrymandering*, which is still applied to political juggling of any kind.

Gethsemane (*g̃eth-sĕm'a-ne*), the scene of the agony of Christ before his crucifixion. It was a small farm or estate at the foot of Mount Olivet, on the east slope of the Kedron valley, rather more than half a mile from the city of Jerusalem. Joined to it was a small garden or orchard, a favorite resort of Christ and his disciples. The place is not now exactly known, but an inclosure with a few old olive-trees is pointed out to travelers as the site of the garden.

Get'tysburg, Battle of. After defeating the Union army under General Hooker at Chancellorsville, in May, 1863, General Lee, the Confederate commander, determined on an offensive campaign. Marching rapidly down the Shenandoah valley, he crossed the Potomac at Williamsport on the 24th of June. Pressing forward, he invaded Pennsylvania, passing through Chambersburg toward Harrisburg. Meantime General Hooker followed after Lee, crossed the Potomac at Edward's Ferry, and advanced to Frederick, Md. He wished to withdraw the Union force which was at Harper's Ferry; this the government at Washington would not permit, whereupon he resigned his command, and was succeeded by General George G. Meade. The new commander pushed forward to Gettysburg, near the southern boundary of Pennsylvania, on which point Lee was concentrating his army. Here the hostile armies, each numbering about 80,000 men, joined issue in what proved to be one of the most terribly destructive battles of the war. The struggle began on the 1st of July, and raged with fearful carnage for three days. On the afternoon of July 3 the Confederates staked everything in a grand charge on the Union center, but were repulsed with terrible slaughter. The Confederate invasion was at an end. Lee retreated on the 4th, and withdrew his shattered columns across the Potomac. The Confederate loss in the battle was over 30,000; the Union loss was 23,000.

The Union victory at Gettysburg, and the capture of Vicksburg, which occurred at the same time, may be regarded as decisive of the war. The struggle continued for nearly two years, and was marked by terrible battles; but from this time the strength of the Confederacy steadily declined, and the power and authority of the Federal government as steadily advanced.

Geyser, a very remarkable phenomenon which occurs in certain regions of the earth which were formerly volcanic and have retained considerable heat. A typical geyser consists of a crater with a funnel-shaped opening into the earth. From this opening, at fairly regular intervals, a column of hot water and steam is ejected, sometimes to the height of a few feet, say five or six, and sometimes to a height of 150 feet, as in the case of the geyser known as Old Faithful in Yellowstone Park. Until about 1870 Iceland was considered the principal seat of geysers — but we now know that Yellowstone Park contains more geysers than all the rest of the known world.

The geyser was first explained by the chemist Bunsen, of Heidelberg, who went to Iceland in 1847 and made an elaborate study of the Great Geyser. His explanation is as follows: A deep crevasse or well-shaped hole in the volcanic rock is filled with water furnished by springs. This water is heated by the lava which is still hot. The circulation of the water in this long tube not being easy, connective equilibrium is not reached. The water in the lower part of the hole is considerably hotter than that in the upper part; for it is under more pressure than that of the atmosphere. Each horizontal layer of water is hotter than the one just above it.

After the water has reached its boiling-point at the top of the column, anything which disturbs one of these layers, *i. e.*, anything which shifts one of the layers into a position a little higher, will relieve the pressure on this layer. The water of this layer will then be above its boiling-point and will burst into steam. This steam will slightly lift the whole column, thus relieving pressure on all water below the disturbance. Hence the whole thing bursts into steam until it is cooled below the boiling-point. The crater catches considerable of the water which has been thrown up and turns it back into the tube. The remainder is made up by springs which feed the tube. And when the whole has been again heated to boiling-point, the eruption occurs anew.

Some of the geysers in Yellowstone Park throw up mud instead of water. These are known as *mud-geysers*.

About a geyser, deposits of mineral matter, which was in solution in the ejected water, are often made, the basins being composed of it. The deposition of the mineral matter is due partly to the cooling of the water, partly to evaporation but chiefly to the influence of minute plants (*algoe*), which live about the geysers, and which have the power of extracting silica, etc. from solution. The beautiful colors of the deposits about geysers are due to the presence of the plants themselves. The deposits often assume fantastic and beautiful forms. See Le Conte's *Elements of Geology* and Geikie's *Geological Studies*. For a description of these geysers see any good treatise on geology.

R. D. SALISBURY.

Ghats or **Ghauts,** a somewhat V-shaped pair of mountain-ranges in India, running parallel to the east and west coasts of the Indian peninsula respectively and converging near Cape Comorin in the south. The range along the eastern coast is known as the Eastern Ghâts and that along the west coast as the Western Ghâts. The word means a landing-stairs.

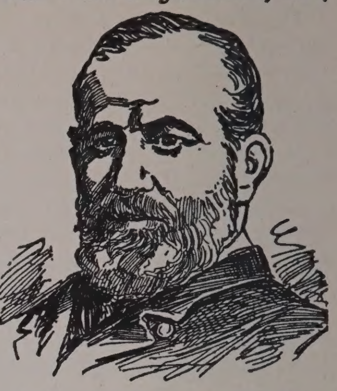
The Eastern Ghâts on an average have a height of about 1,500 feet, extending from near Orissa to the vicinity of Coimbatore at a distance of from 50 to 150 miles back from the Bay of Bengal coast.

The Western Ghâts are much more distinct and continuous than the Eastern Ghâts, but at one point there is a distinct gap 20 miles wide across, known as Palghat Gap. The Western Ghâts extend from the Tapti valley to Palghat Gap, this section being about 800 miles long, and from there to Cape Comorin, a further distance of about 200 miles. The average height of the Western Ghâts is about 3,000 feet, though in some places it is much greater. The range is for long distances quite near the shore, and the ascent from the coastside is often very steep.

Ghent (*gĕnt*), a city of Belgium, capital of the province of East Flanders, is situated at the junction of the Lys and the Scheldt, 34 miles from Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is surrounded by gardens and meadows, while the former walls have been made into pleasure promenades. Among the chief buildings are the cathedral of St. Bavon, dating back to the 13th century (the belfry tower is 375 feet high), the university and the academy of painting. The cotton, woolen and linen manufactures are the chief industries. By the great canal which flows into the Scheldt, Ghent is united with the sea, and it can receive at its docks vessels drawing 17 feet of water. The harbor can contain 400 vessels. With the university, which is a state institution and has 426 students, are united a school for civil engineers and another for arts and sciences.

Ghent was a prosperous city in the time of the Merovingian Franks; in 1007 it was given by the emperor to Count Baldwin IV; and in the 12th century it became the capital of Flanders. In the various wars of which the Netherlands have been the battleground Ghent has suffered severely and has frequently been taken. Falling into the hands of the French during the Revolution, it became the capital of the department of the Scheldt, until, in 1814, it became part of the kingdom of the Netherlands. In 1830 it fell to Belgium. In 1814 was signed here the treaty of peace between America and England, called the Treaty of Ghent. Population 164,659.

Gherardi (*gȧ-rär'dē*), **Bancroft,** an American admiral, was born at Jackson, La., Nov. 10, 1832, and entered the United States navy from Massachusetts as midshipman in 1846. Later he entered and passed through the Naval Academy. He became master and lieutenant in 1855, and served on the *Lancaster*. In 1862 he received promotion and took part in the engagement with Fort Macon. In 1863–64 he successively commanded the gunboat *Chocorua* and the steamer *Port Royal* of the western Gulf-blockading squadron. Aboard the latter vessel he took a prominent part in the battle of Mobile Bay. He became commander in 1866, captain in 1874, commodore in 1884 and rear-admiral in 1887. In 1886 he was appointed commandant of the Brooklyn navy-yard; in 1893 he was in chief command at the Columbian international naval parade in New York harbor; and in 1894 he was placed on the retired list.



REAR-ADMIRAL GHERARDI

Ghetto, the name given to a Jewry or quarter reserved for the Jews in a large city according to the custom of the middle ages, was a term first employed in Rome. There Pope Paul IV forbade Jews to venture from their ghetto without a yellow hat if male, or veil if female, to distinguish them. The term is now used of any Jewish quarter, for instance, the densely packed Jewish district in New York City. The Roman ghetto was destroyed in 1885 to make room for a new Tiber embankment.

Ghibellines. See Guelphs.

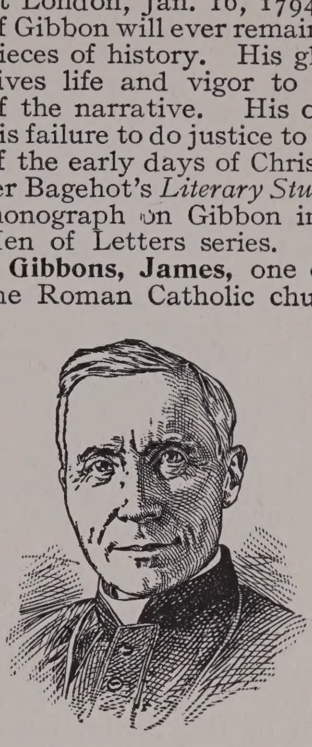
Ghiberti (*gē-bĕr'tē*), **Lorenzo,** an Italian goldsmith, bronze-caster and sculptor, was born at Florence about 1378. Along with other artists he was chosen by the Florentine guild of merchants to compete for the execution of a gate of bronze. The subject of the design was *The Sacrifice of Isaac*, to be made as a model for one of the panels. The judges selected Ghiberti's design, both on account of the art and beauty of its conception and the delicacy and skill of its execution. He was also intrusted by his fellow-citizens with another gate, which contains ten reliefs on a large scale. He spent 50 years of the most patient labor on the gates, and the grace and grandeur of these compositions are beyond praise. Michael Angelo said that "they were worthy to be the gates of Paradise." Among his other works may be mentioned bronze statues of *John the Baptist*, *St. Stephen* and others. He died at Florence, Dec. 1, 1455.

Ghike, Helen. See Koltsof-Masalski, Princess.

Ghirlandajo (*gẽr-lȧn-dä'yō̆*), **Domenico Corradi,** nicknamed Il Ghirlandajo (the garland-maker), an Italian painter, was born in 1449 at Florence. As a youth he was apprenticed to a maker of metal garlands, and it was not until his 31st year that he became known as a painter. He painted mainly frescoes in his native city. He also painted, in the Sistine Chapel at Rome, the fresco *Christ calling Peter and Andrew.* Besides these, he executed some easel-pictures of great merit. His mosaic of the *Annunciation* in the Cathedral of Florence is especially celebrated. Michael Angelo for a time was one of his pupils. He died on Jan. 11, 1494.

Giants' Causeway, a sort of natural pier or mole of basalt, in the form of columns, extending from the coast of Antrim, Ireland, into North Channel. It obtained its name from a legend that it was the commencement of a road to be built by giants across the channel to Scotland. It is part of an overlying mass of basalt, which covers almost the whole county of Antrim and the eastern part of Londonderry and appears in several remarkable beds, of which the Giants' Causeway is one. This remarkable bed is exposed for 300 yards, and forms an unequal pavement, formed of the tops of 40,000 vertical, closely-fitting columns, which in shape are chiefly six-sided, though examples may be found of five, seven, eight or nine sides.

Gib'bon Edward, the greatest of English historians, was born at Putney, near London, April 27, 1737. His own autobiography tells clearly the story of his life. A sickly childhood was followed by 14 months at Oxford, which he himself called the most idle and unprofitable months of his life. His adoption of the Roman Catholic faith barred him out of Oxford, but at Lausanne, on Lake Geneva, he again became a Protestant. Here he spent five years carrying out those private studies in French literature and in the Latin classics which, aided by his prodigious memory, made him a master of learning without a superior. In 1758 he returned to his father's house, and spent some time in the wandering life of a captain of grenadiers, and later visited Italy. "It was at Rome," he says, "as I sat musing in the midst of the capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind." He served for some time in parliament, and in 1776, after the labors of seven years and infinite care in its composition, he published the first volume of the *Decline and Fall of the Roman Empire.* Its success was immediate, but the attack which it contains upon Christianity provoked sharp criticism against the author. He again settled at Lausanne, where the six volumes of his great work were finished. His last years were not happy, and he died at London, Jan. 16, 1794. The great work of Gibbon will ever remain one of the masterpieces of history. His glowing imagination gives life and vigor to the stately march of the narrative. His one great fault was his failure to do justice to the moral grandeur of the early days of Christianity. See Walter Bagehot's *Literary Studies* and Morrison's monograph on Gibbon in Morley's English Men of Letters series.


CARDINAL GIBBONS

Gibbons, James, one of the cardinals of the Roman Catholic church in the United States, was born at Baltimore, July 23, 1834, where he graduated at St. Mary's Seminary in 1857. In 1868 he was appointed bishop of Adramyttium and first vicar-apostolic of North Carolina, where his work was marked with a thoroughness and success which led to his promotion to the see of Richmond in 1872. Here his zeal and ability were further demonstrated, and in 1877 he became coadjutor to Archbishop Bayley. On the death of the latter in the same year Bishop Gibbons became Archbishop of Baltimore. He presided at the plenary council of Baltimore in 1884, and Leo XIII, approving of the acts and decrees of this council, created him cardinal in 1886. In this high office he showed the qualities of a wise and able prelate, and gained wide influence, not only as a leading churchman, but as a thoroughly progressive and patriotic citizen. He wrote *The Faith of Our Fathers; Our Christian Heritage;* and *The Ambassador of Christ.* He died March 24, 1921.

Gibraltar (*jĭ-brạl'tär*), a mass of rock in the southwest of Spain, at the end of a low, sandy peninsula which juts out on the Mediterranean. It is a crown-colony and garrison of Great Britain. It rises to a height of 1,408 feet, is three miles in length and three fourths of a mile in average breadth. Its western side is washed by the Bay of Gibraltar, and on the same side at the foot of the rock is the city of Gibraltar, which has a population of 24,701, including the garrison of between 5,000 and 6,000 men. At the northern base of the rock is the open space called the

North Front, extending as far as the British lines; and between the British and the Spanish lines is the neutral ground, which is uninhabited. Almost the entire rock bristles with artillery, and huge piles of shot and shell are stowed away in convenient places ready for use. The approaches from all sides are guarded by a number of formidable batteries, mounted with guns of the heaviest caliber, and by fortifications so strong in themselves and in their relation with one another, that the rock is considered impregnable, so long as there are sufficient garrison and provisions for maintenance and defense. The eastern side is so steep as to be altogether secure from assault.

Gibraltar has been known in history since the days of the early Phœnician navigators. The Greeks called it Calpe, and it and Abyla (now Ceuta) opposite formed the Pillars of Hercules, long held to be the western boundary of the world. It was fortified in 711 A. D. by the Saracen leader, Tarik. It was held later by the Moors and also by the Spaniards. In 1704 it was captured by a combined Dutch and English force. Since that time it has remained in the hands of the British, in spite of desperate efforts of Spain and France to dislodge them. Modern steam-navigation has enabled vessels to pass through the strait twenty miles from Gibraltar, out of reach of the British guns, so that the impregnable fortress is no longer the key to the Mediterranean. See H. M. Field's *Gibraltar.*

Gibson, Charles Dana, an American illustrator, was born at Roxbury, Mass., 1867. He studied at the Art Students' League, New York, and as early as 1886 had achieved considerable success as artist for periodicals. In 1889 he studied at Julien's studio in Paris. He was again in Paris in 1893–94, and in London in 1895–96. A considerable amount of his work has appeared in the comic weekly, *Life.* He has shown much cleverness as a society-cartoonist, particularly in his satirical depictions of wealthy society-life. The striking feature of his art is its extreme simplicity. He takes his subjects from such places as the clubs, stations, theaters, music halls and boulevards. He is well-known on account of his creation of the type called the Gibson girl.

Gid'dings, Joshua Reed, an American statesman, was born at Athens, Penn., Oct. 6, 1795, and early removed with his parents to Ohio. He was called to the bar, and became a member of the state legislature. He sat in Congress from 1838 to 1859, and was one of the most outspoken of the antislavery leaders, inspiring Lowell to a trumpet-toned sonnet. In 1842 he was censured by a congressional vote for his agitation, but at once resigned, appealed to his constituents and was re-elected by a large majority. In 1861 he was appointed consul-general in Canada, and died at Montreal, May 27, 1864. He published a volume of speeches and other works.

Gid'eon or **Jerubbaal,** whose name means the hewer, was the greatest of the judges of Israel. His history is narrated in *Judges* 6–8. He is mentioned in *Hebrews* as a hero of faith.

Gila (*hē'lä*), a river of New Mexico and Arizona, the principal branch of the Colorado River. It rises in the Sierra Madre Mountains, flows generally westward, and joins the Colorado about 75 miles above the fall of that river into the Gulf of California. Its length is from 500 to 600 miles. Gold and silver are found near this river in Arizona, and the ruins of an ancient civilization abound in its lower valley.

Gila Monster, the name applied to a poisonous lizard (*Heloderma*) found in the region of the Gila. It is the largest lizard of North America, attaining a length of three feet, and the only poisonous one. It inhabits Arizona, New Mexico and the country southward. It is covered with rounded scales standing out like the heads of rivets. The color is black, with irregular orange spots. It ordinarily is slow and uncertain in its movements. It is shunned by animals and man and held in great fear by the Indians, though it does not begin an attack, and its poison is not necessarily fatal to human beings. The poison acts upon the heart, causing it to stop.

GILA MONSTER

Gil'bert Islands, The, lie on the equator in the Pacific Ocean and consist of sixteen atolls with an area of 166 square miles and a population of 35,200 Exports largely consist of copra and sharks' fins.

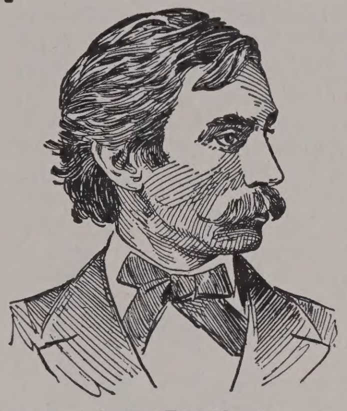
Gilbert, Sir Humphrey, an English navigator, was born near Dartmouth, England, in 1539, and after studying at Eton and Oxford abandoned his purpose of studying law and took to the career of arms. He was knighted for good service in Ireland, and served five years in the Netherlands. He wrote a *Discourse on the Northwest Passage to India.* With his younger half-brother, Sir Walter Raleigh, he sailed in 1578 in quest of the "unknown goal," but his expedition ended in failure. Nothing daunted, he again set sail, and, landing in Newfoundland, took possession of it in the name of Queen Elizabeth. But he lost three of his vessels, and, attempting to return with the other two, his own vessel was lost in 1583. See Hakluyt's *Collections.*

Gilbert, William, an English physician and physicist, was born in 1540, and died in 1603. He was educated at St. John's College, Cambridge, where he received the degrees of B. A. and M. D. For thirty years he was a practicing physician in London. Queen Elizabeth appointed him court-physician and gave him a pension which enabled him to pursue his scientific work. His magnetic discoveries constitute his most important work. These are recorded in his *Treatise on Magnets, Magnetic Bodies and the Magnetism of the Earth,* published at London in 1600. Modern views of magnetism date from the publication of this work; for in it Gilbert offers evidence for thinking that magnetism is a molecular phenomenon, that magnetic quality disappears at red heat, that magnetic forces act equally through air and other non-magnetic bodies and that the earth itself acts as a great magnet. He also describes the phenomenon of magnetic induction.

Gilbert, Sir William Schwenk, English dramatist, was born at London, Nov. 18, 1836, and studied for the bar. He came into note first by his amusing *Bab Ballads,* contributed to *Fun,* and as a playwright and writer of librettos for comic operas, many of which were set to music by the late Sir Arthur Sullivan. The list of the latter includes the following comedies, burlesques and operas: *Pygmalion and Galatea; Trial by Jury; The Sorcerer; H. M. S. Pinafore; Pirates of Penzance; Patience; Iolanthe; Ruddygore; The Gondoliers;* and others. All in their day attained great popularity. Others of his productions include *The Mikado,* which was also a great success, *His Excellency* and *The Mountebanks,* besides a number of songs. He died May 29, 1911

SIR WILLIAM S. GILBERT

Gilder, Richard Watson, American poet and *littérateur* and editor of *The Century Magazine,* was born at Bordentown, N. J., Feb. 8, 1844, and was educated at Bellevue Seminary, founded by his father, the Rev. W. H. Gilder. In 1870 he became associate-editor of *Scribner's Monthly* with Dr. J. G. Holland, and in 1881 was made editor-in-chief of *The Century.* Besides his magazine-work, he published a number of volumes of musical verse, whose fine quality and flavor have given him high rank among American poets. These include *The New Day,* a volume of choice lyrics, published in 1875; *The Celestial Passion* (1887); *Lyrics* (1885 and 1887); *Two Worlds and Other Poems* (1891); *The Great Remembrance and Other Poems* (1893) all being the work of a genuine poet and literary artist. In 1893 Gilder published his *Five Books of Song,* which embraces most of his poems. His other lyrical and general work includes *Fantasy and Passion, In Palestine, In the Heights, A Book of Music, A Christmas Wreath* and *Poems and Inscriptions.* He died Nov. 18, 1909.



RICHARD WATSON GILDER

Gil'dersleeve, Basil Lanneau, an eminent American classical scholar and professor of Greek in Johns Hopkins University, Baltimore, Md., was born at Charleston, S. C., Oct. 23, 1831, and, after graduating at Princeton, studied in Germany at Bonn, Berlin and Göttingen. In 1856 he was elected professor of Greek in the University of Virginia, where he remained till 1876, when he accepted a similar post at Johns Hopkins on the opening of the latter institution. Professor Gildersleeve has since 1880 edited the *American Journal of Philology,* and has published a *Latin Grammar,* a *Syntax of Classical Greek, Essays and Studies,* editions of the *Satires* of Persius, the *Odes* of Pindar and a work on *Justin Martyr.*

Gil'ead is a mountainous district on the east side of the Jordan. Though all is desolate above, on the slopes the growth is luxuriant, and forests of oak and terebinth occur. The district was given to the tribes of Manasseh, Gad and Reuben, because of the multitude of their cattle, and, as a frontier land, was much exposed to invasion. Ramoth, Jabesh and Jazer are three of its cities mentioned in Scripture. A plan has been presented to the government at Constantinople to have this region colonized by Jews. See Oliphant's *Land of Gilead.*

Gills. See Respiration, Organs of.

Gil′man, Daniel Coit, LL. D., American scholar and educator, was born at Norwich, Conn., July 6, 1831, and was educated at Yale University and at Berlin. In 1855 he became librarian at Yale and professor of physical and political geography, and took an active part in the organization of Sheffield Scientific School. From 1872 to 1875 he was president of the University of California, and in the latter year became president of Johns Hopkins. In 1879 he acted as president of the American Social Science association, and in 1893 became president of the American Oriental Society. His published writings include *James Monroe* (in American Statesmen Series); *University Problems;* an introduction to an edition of De Tocqueville's *Democracy in America;* and *Our National Schools of Science.* He has edited the writings of Francis Lieber, the German-American political economist. His other writings embrace a *Memoir of James Dwight Dana*, the geologist, and a volume entitled *Science and Letters in Yale.* He received the degree of LL.D. from Harvard in 1876, from Columbia in 1887, from Yale in 1889 and from Princeton in 1896. He resigned the presidency of Johns Hopkins in 1901, and was succeeded by Dr. Ira Remsen. He for a time was president, and one of the trustees, of Carnegie Institution at Washington, D. C. He died on Oct. 14, 1908.

DANIEL COIT GILMAN

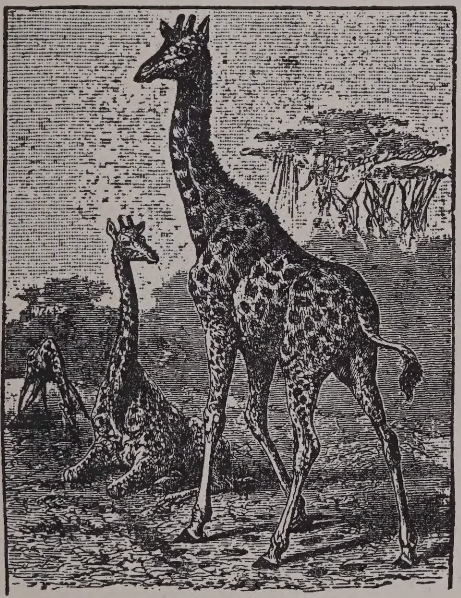
Gin or **Geneva,** an alcoholic drink, distilled from malt or from unmalted barley or other grain and afterward flavored. The gin, which forms the common drink of the lower classes of London, is flavored very slightly with oil of turpentine and common salt. Usually about five ounces of spirit of turpentine and three and one half pounds of salt are mixed in ten gallons of water; this is then placed with 80 gallons of corn-spirit in a still and allowed to distill. Gin is an article of great manufacture in Holland, whence comes most of that used in the United States. Very little pure gin is found; it consists of 51.6 parts of alcohol in 100 parts.

Gink′go, a genus of one species, commonly known as the maiden-hair tree, because its leaves resemble those of the ordinary maiden-hair fern. This genus is the only living representative of a group of Gymnosperms once widely distributed throughout the world. The ginkgo is commonly used in parks, on account of its unusual and attractive appearance, but it has been chiefly perpetuated by its cultivation in temple-grounds in China and Japan, where it is regarded as a sacred tree. For a long time it was thought that it did not exist as a native tree, but had been preserved from extinction only through cultivation. Recently, however, it has been found in forests in western China, but it does not occur in great quantities, so that it really is almost extinct as a native plant.

Giorgione (*jôr-jō′nȧ*), meaning Great George, the name given by reason of his stature and his fame to Giorgio Barbarella, an Italian painter, who was born about 1477. At Venice he was a fellow-pupil with Titian, and as a painter he soon gained a reputation. His work showed intense poetic feeling, great beauty and richness of coloring and naturalness and independence in manner. He painted many portraits and did much fresco-work, but only a few canvases known to be his are still in existence. Among them are *The Family of Giorgione*, now at Venice; *The Three Philosophers*, in the Belvedere, Vienna; and *The Sleeping Venus*, in the Dresden gallery. He ranks with the very greatest of Venetian painters, and his example powerfully influenced the artists of his day, even Titian himself. He died of the plague at Venice in 1511.

Giotto (*jŏt′tō*) **di Bondone,** one of the greatest of early Italian painters and also celebrated as an architect, was probably born in 1266 near Florence. At ten he was discovered by the artist, Cimabue, tending his father's flocks and drawing one of the lambs upon a flat stone, and was taken by him to Florence and instructed in art. The earliest of his works that have been preserved are a series of 28 frescoes, scenes from the life of St. Francis, in the church at Assisi. Soon afterward he was employed at Rome, where the mosaic of the *Navicella* may still be seen in the vestibule of St. Peter's, and at Florence, where, in a fresco, occurs a profile-likeness of his friend Dante. The next great series of works by Giotto are the frescoes in the Arena chapel at Padua, where the artist is seen rising to his highest power. The frescoes include 38 subjects from the lives of Christ and Mary, a *Christ in Glory*, a *Last Judgment* and a series of 14 single figures personifying the main virtues and their opposing vices. But the frescoes in the chapels in the church of Santa Croce, Florence, are the finest specimens of the artist's genius. Giotto also did important work at Naples, and in 1334 he was appointed master of works of the cathedral and city of Florence, where he decorated the cathedral with statues and designed the beautiful tower called the Campanile and the vivid bas-reliefs which adorn its base. He died on Jan. 8, 1337. The oft-quoted story of the "O of Giotto" tells how, when the pope sent a messenger to ask the painter for a specimen of his art, with a view to future employment, "Giotto took a sheet of paper and a pencil dipped in red color, then resting his elbow on his side, to form a sort of compass, with one turn of his hand he drew a circle so perfect and exact that it was a marvel to behold," and handed this to the courtier as a sufficient proof of his skill. From this anecdote comes the Italian phrase: "As round as Giotto's O." See H. Quilter's *Giotto.*

Giraffe, a picturesque animal of Africa, with spotted skin and very long neck. The giraffe is the tallest of living animals, a full-grown male being 12 feet at the shoulders and 18 to the crown of the head. It is common in equatorial Africa and Abyssinia, but is not found south of Orange River The skin is dark brown, varying to black in old specimens, with angular, rusty spots. On account of its spotted skin it is sometimes called the camelopard. In spite of the great length of the neck there are only seven (the usual number) neck-vertebræ, each one being elongated. The legs are slender, the fore ones longer than the hind, and end in cloven hoofs. It feeds on the foliage of trees like the mimosas, acacias, etc, gathering its food with the long, slender tongue. It is a ruminant or cud-chewer. The heads of both male and female are provided with horn-like outgrowths of bone, about eight inches long. These are covered with skin, which ends in bristles. The eyes are prominent, and so situated that they can see behind as well as forwards and to the sides; this makes them hard to approach by their two chief enemies, the lion and man. They are hunted on horseback, with selected horses of the best quality, and when overtaken are cut in the ham-strings with a sword, while on the run.



GIRAFFE

Girard (*jĭ-rärd′*), **Stephen,** an American merchant and banker, was born near Bordeaux, France, May 24, 1750. The son of a seaman, he began life as a cabin-boy, became master and part-owner of an American coasting-vessel, and in 1769 was able to start in business at Philadelphia as a small trader. With a remarkable capacity for business and a habit of strictness in money-matters he rapidly grew rich, and was recognized as one of the leading merchants of the city. In 1812 he founded a bank which proved a great benefit to the national currency. During the War of 1812 he loaned the government $5,000,000. He also became a director in the United States bank. He was frugal and close in business affairs, stern in exacting the last farthing due him, but was generous in public-giving. He was uneducated, and in religion was a freethinker. At his death, which occurred Dec. 26, 1831, he bequeathed most of his vast fortune to public purposes, but the most important gift was that of $2,000,000 and a plot of ground in Philadelphia for the erection and support of a college for orphans, since known as Girard College. The most careful directions were left as to the grounds and buildings. The main building, built of marble, is one of the finest specimens of Greek architecture in America. Boys who are orphans are admitted between 6 and 10, fed, clothed and educated, and, when between 14 and 18, positions are found for them. The principles of morality are taught, but no particular religious creed. There are 1,578 pupils.

Girardin (*zhĕ-rär-dăn′*), **Émile de,** an eminent French journalist and politician, was born at Paris, June 22, 1806, and educated there. After several early literary attempts he founded in 1836 the *Press,* which politically leaned toward the conservative side. Girardin gradually became a Republican. He promoted Louis Napoleon's election to the presidency, but later on threw himself into the arms of the Socialists. He afterward edited the *Liberty,* and his paper was active in urging on the Franco-Prussian War. The *France,* founded in 1874, and the *Little Journal* both supported the republic. He wrote a few pieces for the stage. He died on April 27, 1881.

Girondists (*jĭ-rŏn′dĭsts*), the moderate Republican party during the French Revolution. The name was given because its earliest leaders were from the Gironde department. Early in 1792 Louis XVI was compelled to form a Girondist ministry, but soon dismissed them, a measure which led to the insurrection of June 20, 1792. The Jacobins soon after gained the leadership, and, although the Girondists tried to save the king's life, it was impossible. The fall of their leader, Roland, and the ascendancy of Robespierre followed; and, soon after, many of the members were arrested, tried and sentenced to death by the Mountain, as the extreme party was called. On their way to the place of execution they sang the *Marseillaise*. Sixteen months later the remaining outlawed members returned to the convention.

Girouard, Hon. Desire, born and educated in the Province of Quebec. A graduate in law of McGill University. A successful practitioner and writer on legal and historical topics. More than any other writer he has thrown light on the early history of the Island of Montreal. He was first elected to the House of Commons in 1874 and became an influential member. He was appointed judge of the Supreme Court in 1895, a position which he still holds. Sir Percy Girouard of the Royal Engineers, who has won distinction as a member of Lord Kitchener's staff, is his son.

Glace Bay is a rapidly growing city on Cape Breton Island, fifteen miles by rail from Sydney, with a fine beach. Its 2,459 inhabitants in 1891 were increased to 6,945 in 1901 by the development of the extensive coal mines.

Glaciers. Glaciers are streams or sheets of slowly moving land-ice. They are developed from great accumulations of snow. The processes by which snow is converted into ice are somewhat complex. One factor in the change is the pressure due to the weight of the snow itself. This tends to convert the lower portion of a field of snow into ice. Again, the surface snow of a snow-field is subject to melting during the sunny days of summer, and the water, sinking beneath the surface, may freeze again. In freezing, it not only becomes ice, but tends to bind the snow where it freezes into a solid mass. The ice of glaciers is in more or less distinct layers, some of which are bluer and more compact than others. Since glaciers are formed from large accumulations of snow, it follows that they are found only where conditions are such as to allow the accumulation of snow in large quantities.

GLACIER OF ZERMATT, SWITZERLAND

When the ice in a snow-field becomes sufficiently thick, movement begins. The exact nature of the motion is somewhat uncertain, but the results are such as they would be if the ice flowed like an extremely viscous fluid. The ice is, however, so brittle as to break under tension, and crevasses are formed where the ice moves over considerable irregularities of bed, and in some other circumstances. The rate of motion is very slow, usually varying in glaciers which have been studied from a few inches to a few feet a day. Once in motion, the ice moves forward and downward until it reaches a position where melting balances forward motion.

Glaciers occur in high altitudes in all latitudes and in all altitudes in high latitudes. There are various types of glaciers, chief among which are (1) narrow valley-glaciers like those of Switzerland, called *alpine* glaciers, and (2) broad ice-sheets like that of Greenland. Glaciers of the alpine type abound in many high mountains. The best known are in Switzerland and Scandinavia, but alpine glaciers also occur in the Pyrenees, the Caucasus, the Himalayas and the Tien Shan Mountains, in the Cordilleras of the western part of North America, in the Andes of South America and in the high mountains of some other parts of the world. The Alps alone harbor more than 1,000 glaciers, most of which are very small, the largest (the Aletsch) being scarcely more than ten miles long. Glaciers are numerous in the northwestern part of the United States, especially in the Cascade Range. Though the glaciers of this region have never been enumerated, there certainly are many hundreds, probably thousands of them. Glaciers occur in the Sierras as far south as central California. They abound in the Cordilleras north of the United States, and are found on some of the higher mountains of Mexico. The best-known ice-sheet is that of Greenland, which has an estimated area of between 300,000 and 400,000 square miles. The most extensive ice-sheet is that of Antarctica, the area of which perhaps is ten times as great as that of the ice-sheet of Greenland.

One ice-sheet may give rise to many glaciers about its borders, as in the case of the Greenland ice-sheet; or glaciers from small ice-sheets may unite to form a single glacier as in many mountain regions.

In their movement glaciers produce notable effects on the surfaces over which they pass. In the first place, they gather up the loose débris on the surface over which they move. This débris is carried forward a greater or less distance, and finally deposited. If the surface over which a glacier moves is rough, the ice tends to make it smooth by breaking off the projecting points. The bottom of the ice thus becomes charged with stony débris, and this débris increases the wear which the moving ice inflicts on the surface over which it passes. The earthy and stony material carried by the ice is moraine matter. The larger part of it is carried in the base of the ice. After deposition this basal material is called *ground moraine*. If the end of a glacier or the edge of an ice-sheet remains constant in position for a long period of time, considerable accumulations of *drift*, as the débris is called, are made at the margin of the ice. Such marginal accumulations are *terminal moraines*. The surfaces of alpine glaciers often carry some débris. If this is arranged in belts along the sides of a glacier, these belts are *lateral moraines*. The same name is applied to belts or ridges of drift deposited along the lateral margins of a glacier. If the débris on the ice is arranged in belts remote from the edges but lengthwise of the glacier, they are *medial moraines*. The material of lateral and medial moraines does not chiefly fall on the ice, as is commonly supposed, but works up from beneath. The melting of the ice gives rise to abundant water, which frequently carries away the material which the ice has carried and deposited.

In high latitudes glaciers often descend to the sea before being melted. In this case their ends may be broken off and float away as icebergs. In mountain regions the ends of glaciers sometimes break off and fall or slide rapidly down precipitous mountain slopes. Such ice slides, like slides of snow in great quantity, are avalanches.

At certain periods in the past history of the earth ice-sheets have been very much more extensive than now (see glacial period, under GEOLOGY). See *Glaciers* by Shaler and Davis; also articles on glaciers in the *Journal of Geology*.

R. D. SALISBURY.

Glad'den, Washington, American author and Congregational clergyman, was born at Pottsgrove, Pa., Feb. 11, 1836, and graduated in 1859 from Williams College. He held pastoral appointments in Brooklyn, N. Y., Morrisania, N. Y., North Adams, Mass., Springfield, Mass., and later was pastor of the First Congregational Church, Columbus, Ohio. His writings were largely on religious subjects as well as upon social reform. His chief works embrace *Applied Christianity; The Christian Way; Who Wrote the Bible? The Church and the Kingdom; Ruling Ideas of the Present Age; Tools and the Man.* He died in 1918.

Glad'iator, a professional fighter in the arena of a Roman amphitheater, against either another gladiator or a wild beast. The custom of giving gladiatorial shows seems to have been borrowed from Etruria, where slaves and prisoners were sacrificed on the tombs of illustrious chieftains. At Rome they took place at first at funerals only, but afterward in the amphitheater, where they lost all religious character. The first one occurring in Roman history was between three pairs of gladiators, arranged by Marcus and Decius Brutus, on the death of their father in 264 B. C. The fashion rapidly spread, and it became the custom, especially during the last years of the republic, for public officers and candidates for popular favor to give free gladiatorial exhibitions to the people. But the emperors exceeded all others in the extent and magnificence of these spectacles. Julius Cæsar gave a show at which 320 couples fought; Titus gave an exhibition of gladiators, wild beasts and sea-fights which lasted 100 days, in which 10,000 men fought with each other or with wild beasts. Gladiators for the most part were prisoners taken in war, and slaves, with the worst classes of criminals. But in the times of the emperors freemen and men of broken fortune began to enter the profession; and later on knights and senators fought and even women. The successful fighter was at first rewarded with a palm-branch, but in later years it became the custom to add to this rich and valuable presents and a prize of money. When a gladiator was thrown down or disarmed, if the spectators turned up their thumbs, the vanquished man was to be spared, and if they turned them down, he was to be slain; or, as is more probable, if they turned their thumbs toward their breasts, he was to be stabbed, and if they turned them down, the sword was to be dropped. Many attempts were made to limit or stop gladiatorial

GLADIATORS

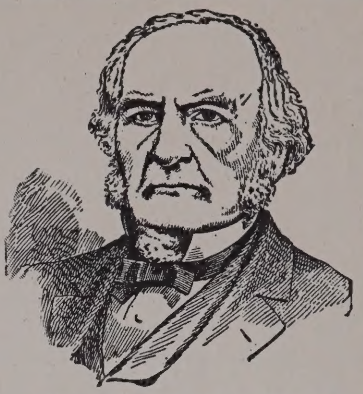
contests. They were finally stopped by the splendid daring of Telemachus, an Asiatic monk, who in 404 journeyed to Rome and there, rushing into the arena, strove to part two gladiators. The spectators stoned him to death, but the Emperor Honorius proclaimed him a martyr and issued an edict suppressing such exhibitions.

Gladi'olus, an ornamental plant of the iris family. It has beautiful spikes of flowers, sword-shaped leaves and a flattened solid bulb from which the stem grows. Sword-lily and corn-flag are names sometimes applied to these plants. There are both hardy and tender kinds. Several kinds are European, but the majority are from the Cape of Good Hope. They are raised from bulbs or from seed, and in this way many hybrids or mixed sorts have been produced. Among the tender kinds which are grown in pots in winter or planted in the open ground in spring, the most popular and brilliant are these hybrids. In size, beauty of form and variety of flower-coloring they far excel any of the other kinds and are constantly improving. The colors range from pure white through rose to crimson, scarlet and violet; some have yellow as the prevailing color; and some are variously striped, shaded and stained in the most brilliant combinations. See Robinson's *Flower-Garden.*

GLADIOLUS

Gladstone (*glăd'stŭn*), **Herbert J.,** M. P. for Leeds, West, in the English Parliament, is the fourth son of the late Wm. Ewart Gladstone, in whose last government he held office as Under Home-Secretary and later as First Commissioner of Works, besides acting for a time as private secretary to his distinguished father. In the Liberal ministry of Campbell-Bannerman, Mr. Gladstone held the portfolio of Secretary of State for Home Affairs: he also was a member of Lord Roseberry's ministry in 1904–05. Mr. Gladstone was born in London in 1854, and educated at Eton and at University College, Oxford. From 1877 to 1880 he was lecturer on modern history at Keble College, after which he went into politics during his father's régime, and successively became a junior lord of the Treasury, financial secretary in the War office and, finally, Under Home-Secretary etc. and member for Leeds.

Gladstone, William Ewart, a British statesman, author and orator, was born of Scottish descent at Liverpool, Dec. 29, 1809; and died at Hawarden Castle, May 19, 1898. He studied at Eton, and graduated at Oxford as double first-class, the highest honor and one rarely attained. He entered parliament in 1832 as a Conservative, and became known as a young man of brilliant promise. (Lord Macaulay called him "the rising hope of the stern and unbending Tories.") He was soon called upon to hold office. In 1834 he was made junior lord of the treasury, and the next year under-secretary for the colonies, by Sir Robert Peel, and the two men became close political and personal friends. Gladstone was not a member of the parliament during the period when England veered to free trade, but he was in favor of the new policy. In 1847, still a Tory, he was chosen one of the representatives from the University of Oxford. The death of Peel in 1850 brought Gladstone more directly to the front. His first great speech was made in answer to Disraeli, and from that hour he was recognized as one of the great historic orators of the English parliament. With that speech began the long parliamentary duel between these two masters of debate, which was carried on for twenty-four years. As chancellor of the exchequer, Gladstone made his first budget-speech, which which was said to be the finest explanation of financial questions ever made by a British statesman, and people came to look forward to these speeches with the same interest with which the performance of a great composer is awaited. In 1858 Gladstone was sent on a mission to the Ionian Islands, and about 1859 he became classed as an advanced Liberal. In 1865 the death of Palmerston made Gladstone leader of the house of commons



WILLIAM E. GLADSTONE

He now began to turn his attention to the distracted state of Ireland. In 1868 he became prime minister, and immediately a multitude of reform-measures followed. But by 1874 the wave of reform had subsided, the reaction came, and he resigned and retired from the leadership of the house of commons. For some time he occupied himself with literary and historical studies. But he was soon called back to power, and in 1880 again became prime-minister.

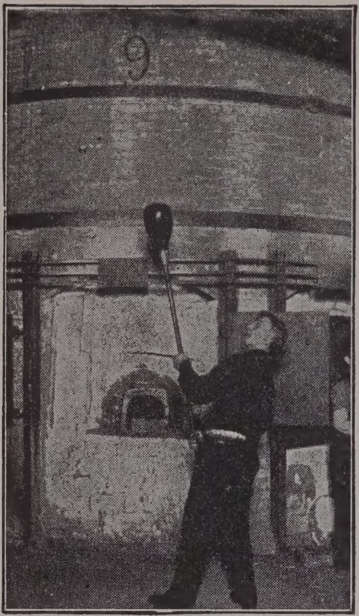
and continued in office, with the exception of a brief period, till 1886. He conducted the nation through very serious times in her history. When, believing that the voice of the Irish people had declared in favor of home rule, he became the champion of that policy, a sudden and serious split took place in his party, and he was defeated. He, however, continued to lead the opposition in parliament. Under his leadership was formed the Gladstonian party which favored home-rule for Ireland. In 1892, on this issue, Gladstone again became prime-minister, resigning on account of age and failing health, March 2, 1894.

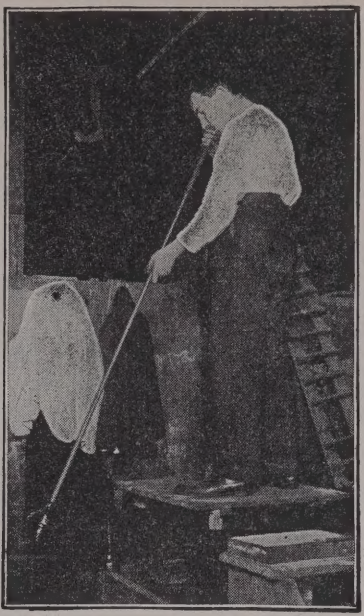
Aside from his fame as a statesman and an orator, Gladstone made a name in literature and scholarship. Among his works are *Juventus Mundi*, *The State in Relation to the Church*, *The Vatican Decrees*, *The Impregnable Rock of Holy Scripture*, *The Irish Question*, *Studies on Homer* and *Gleanings of Past Years*. See *Lives* by John Morley, Herbert Paul, James Bryce and G. Barnett Smith and Justin McCarthy's *History of Our Own Times*.

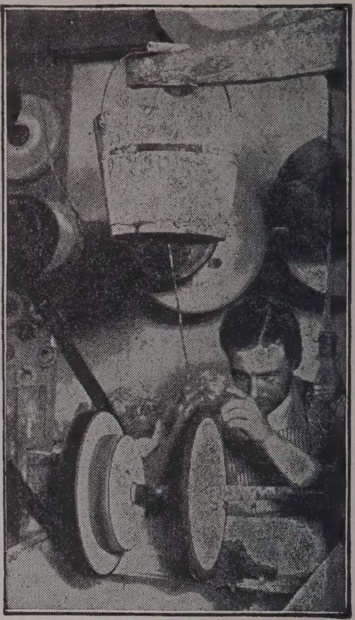
Glas'gow, a royal borough, the industrial center of Scotland and the most populous city of Great Britain next to London, stands on the banks of the Clyde, 42 miles west of Edinburgh. It extends about three and one fourth miles from north to south, and five from east to west. There are about 300 miles of streets; the Clyde is spanned by twelve bridges, of which three are railroad viaducts and two suspension bridges for foot-passengers. Of buildings possessing historical interest, there are none except the cathedral, which dates back to the 11th century, is especially noted for its beautiful crypt or underground chapel, and is unrivaled in Britain. Of modern buildings are the city-chambers; the royal exchange, a handsome building ornamented with colonnades of Corinthian pillars; and the numerous churches. In general, Glasgow is a well-built city; its streets are well laid out and spacious, and the houses which line them are solidly built of excellent stone, which is quarried in abundance near by. It is well-supplied with public parks, and in George Square are a number of statues—Watt, Scott, Burns, Livingstone and others. The University of Glasgow was founded in 1450. It now has 2,500 students, a teaching-faculty of 136 professors and tutors and a library of 200,000 volumes. Other educational institutions are the Glasgow and West of Scotland Technical College, with over 2,000 students; St. Mungo's; the Free Church College; and St. Margaret's College for women. There are two morning and three evening dailies, about a dozen weekly newspapers and periodicals; and one or two monthlies. Three magnificent railroad stations bring traffic to the heart of the city, and the under-ground railway and the city union line, besides the street railways, afford every facility for traveling into most parts of the city. Another means of transsit is found in the fine fleet of river-steamers, which afford access to all the western highlands and islands. One of these steamers attains a speed of twenty-two miles an hour, and can accommodate 2,000 passengers on its daily journey of 160 miles. The Clyde has been a chief source of the great prosperity of Glasgow. It now allows ships drawing twenty-four feet of water to ride at anchor. The harbor and docks give the city a water-area of 210 acres. Beyond the harbor the principal feature of the Clyde is the great shipbuilding and marine engineering yards which line its sides. Here have been built such vessels as the *Etruria*, *City of New York* and *City of Paris*. Glasgow is built over a coalfield rich in seams of iron-stone, and the city has blast-furnaces within its bounds. The making of steamtubes, boilermaking, locomotive-engine building and general engineering are among the principal industries. The dyeing of Turkey-red has been greatly developed; and the chemical works and spinning and weaving industries afford employment to a great part of the population. Besides its cotton-mills, muslin-weaving and many textile-factories, the city has large calico-printing and bleaching-works, tobacco-works and distilling-establishments. Glasgow does not hold an important place in the early history of Scotland. The settlement by the Clyde goes back to about 560 A. D., when the half-mythical St. Kentigern or Mungo appeared as the apostle of Christianity to the rude Celts of that region, and built his little church where the cathedral stands. The place has some importance in religious history as the center of some activity during the time of the Covenanters. But its main fame has always been as an industrial and mercantile city, and its real history began about 1707, when the prospect of a great traffic with America aroused the commercial activity of its people. The population is now 784,455; and the area is about 12,400 acres. See MacGeorge's *Old Glasgow* and Muir's *Glasgow in 1901*.

Glass is a combination of silica with two or more alkalies, alkaline earths or other oxides, as lime and soda. In its ordinary state glass is a solid body with a luster, is more or less brittle, and is commonly transparent. When softened by heat, it may be easily molded into any shape; it welds when red hot; and at a lower heat it may be cut with knives and scissors. But molten glass can be rapidly drawn out into threads hundreds of feet long, and these when cooled can be woven into a beautiful silky fabric. The different kinds of glass are made of slightly different materials.

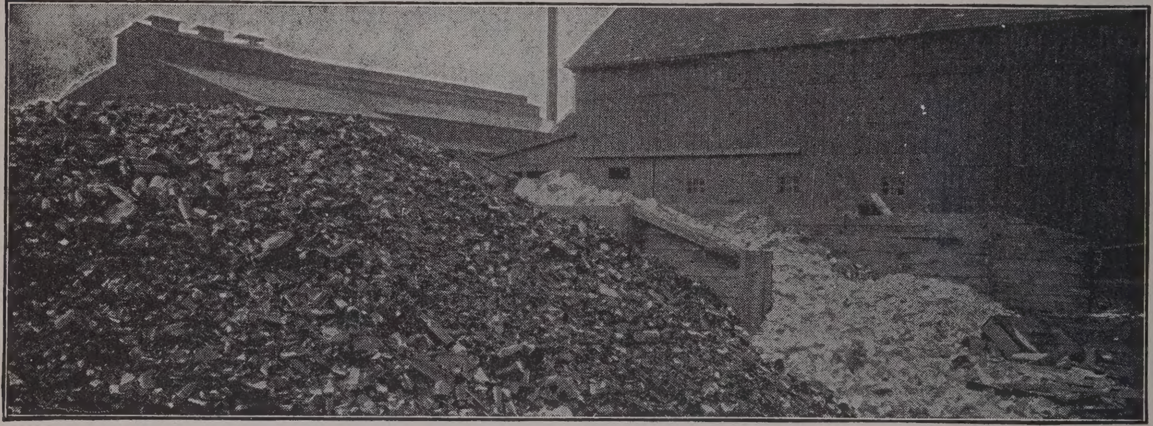
GLASSMAKERS AT THEIR WORK



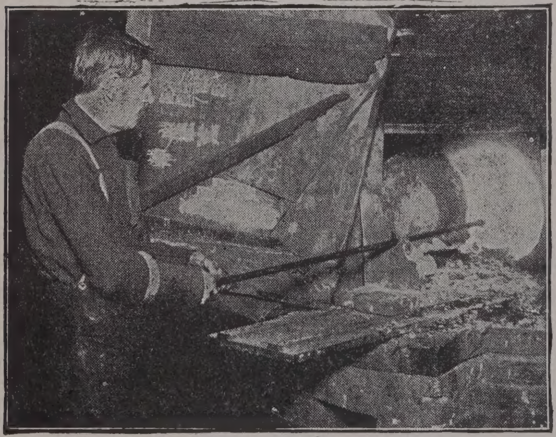


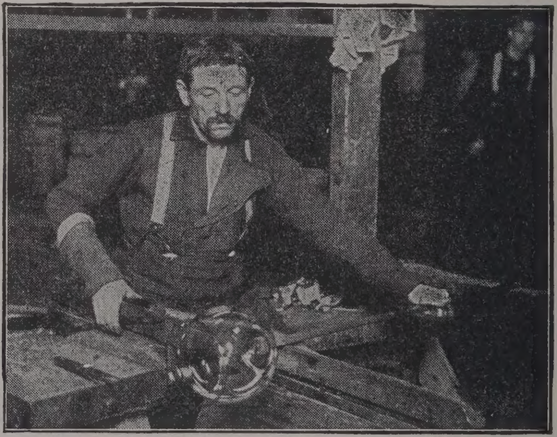


The man on the left has just been gathering glass from one of the huge furnaces. The next man is blowing the glass for a French coffee pot. The one next is cutting glass. He holds it against a wheel, kept wet by water dropping through that tube.



Here we are in the yard of a glass bottle factory. That heap of broken bottles will be made into new ones. The white substance in the bin is soda, which is used to make the glass melt faster in the furnace.





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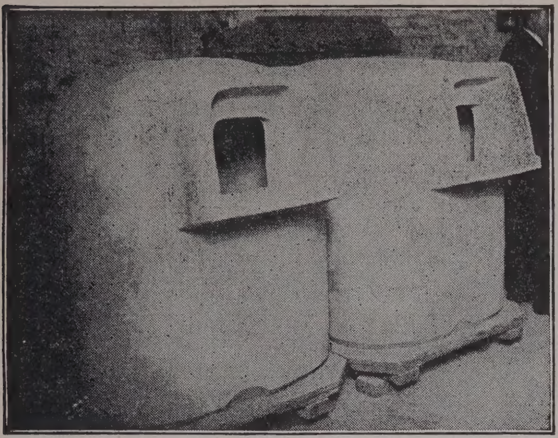
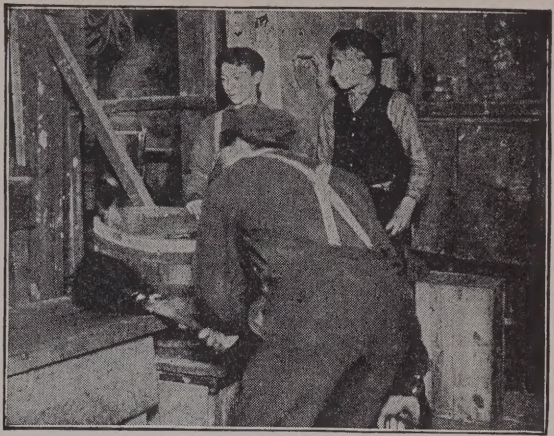
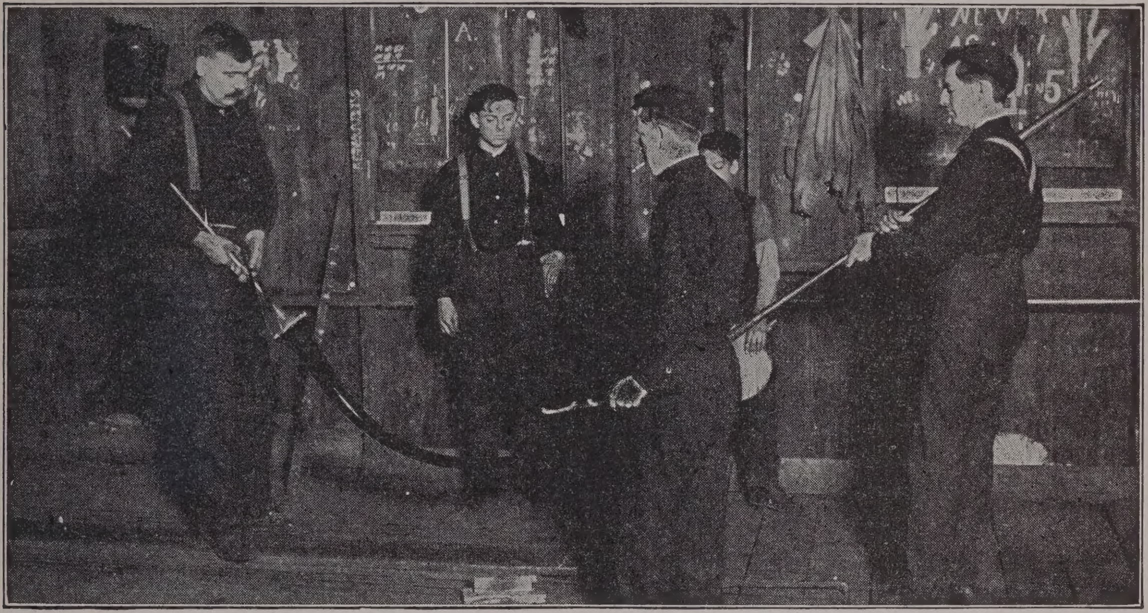
Here is a man at work at a small fuel oil furnace at which globes or bottles are re-heated previous to finishing. The next picture shows a workman finishing a fish globe which has been previously heated at the furnace.

GLASSMAKERS AT THEIR WORK

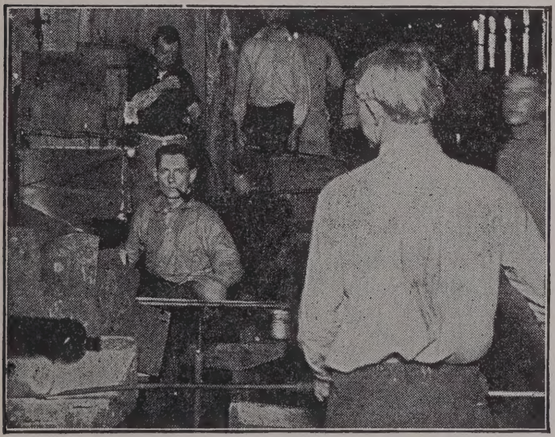


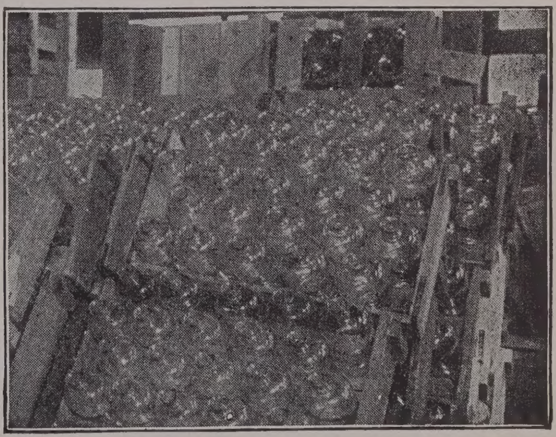


On the left are two of the huge pots which set inside of the furnace. In them the glass is melted. On right is a workman preparing glass for being drawn out into tubes.



This illustration shows how glass tubes are made by drawing the molten glass, as you would pull taffy candy.





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This man is shaping and cooling a glass bottle by turning it on a stone table called a "mart." When ready for shipment bottles are placed in frames as shown in this next picture.

Window-glass including the crown, sheet and plate varieties, is made of silica, soda and lime; flint glass, often called crystal glass, of silica, potash and lead; and bottle glass, of silica, lime and alumina, with sometimes other materials added. Any of these kinds may be colored by the use of certain oxides of metals. Silica is found in its purest form in rock crystals; but all quartz, flint, sandstone and sand are made of it. Pure white sand is now generally used, the best in the world being found in Berkshire County, Mass.

The materials are sifted and mixed together, and then melted in large pots set into a furnace. These pots are made of clay, and about ten of them are placed in a furnace. Opposite each pot is a door through which the workman can fill it with material, and the pots are not taken out until used up, which happens after one or two months. The furnaces also, which are built of fire-proof bricks, are never allowed to cool until, after a year or two, they are worn out. To the other materials already in the pots about one fourth of their weight of broken glass is added; the furnace doors are closed and the fires raised to a white heat, which gradually melts the contents of the pots into liquid glass in about 24 hours. The heat is then allowed to go down until the glass becomes about as thick as paste, in which state it is kept while it is being used by the workmen.

If bottle glass is to be made, a workman now dips a long iron tube called a blowpipe into a pot, and takes up a 'gathering" or enough material to make a bottle. Another workman brings this into a pear shape by slightly blowing and turning it on a stone or iron table, called a marver. The glass is now placed into a mold and made to fill it by blowing down the tube; the bottom is pushed up, and the ring around the mouth is made by the addition of a strip of metal. This process was formerly done by hand. When the glassblower has finished a bottle, it is immediately taken to the annealing oven, where it remains about 36 hours, while it cools very gradually to the ordinary temperature of the air. Articles made in this way, as wine-glasses, tumblers etc., are often subjected to the process of glass-cutting, which is really grinding. The glass is held against a cast-iron wheel upon which a thin stream of sand and water is dripping. The sand leaves rough marks on the glass, which are smoothed out on other wheels and finally polished on a wooden wheel with a soft powder made of the rust of tin and lead. Glass is sometimes engraved by means of the sand-blast. For making plate-glass, crown-glass and sheet or cylinder glass different processes are required. Stained glass, seen mostly in church windows, is made by painting the surface of clear glass with various materials, chiefly the oxides of metals mixed with oil of turpentine. The pictures are painted with brushes, and the glass is then heated until the colors become stained into it. Another kind, called mosaic-glass, is made of a great number of small pieces set in lead frames.

The invention of glass dates from the earliest times, and several nations claim the honor of its discovery. But it probably is due to the Egyptians, among whom glass is mentioned as early as 3300 B. C. They generally made it into beads, vases, small figures, etc. Next came the Phœnicians, and from these two centers the art spread into neighboring centers. Glass making was introduced among the Romans about the beginning of the empire, though glass had long been imported. As it declined in Rome with the decay of the empire, it was transferred to Constantinople, where it flourished during the dark ages. Next the Arabs obtained a knowledge of glass making, and the glass of Damascus became celebrated during the middle ages. Venetian glass also early became famous, and mirrors, goblets and cups from Venice were sent all over the world. Extensive glass works were soon in operation in Germany, France and Great Britain. The first attempt at the manufacture in the United States was at Jamestown, Va., in 1608, and others soon followed. The chief centers of the manufacture in the United States are Pennsylvania, New Jersey and New York. A large part of Pennsylvania glass comes from Pittsburg. Pressed glass is an American invention. With a few exceptions the United States is fully up to Europe in this industry. The production of all kinds in 1909 was $92,185,693. See Sanzay's *Marvels of Glass-Making* and Wallace-Dunlop's *Glass in the Old World*.

Glas'tonbury, an old borough of Somersetshire, England, lies on the River Brue, near Bristol. It is said that Joseph of Arimathea came here, bearing the holy grail, (the cup from which Jesus drank at the Last Supper), and founded the first Christian church in England. He planted his pilgrim's staff on Weary-all Hill, where it took root and blossomed every Christmas Eve. The massive Abbot's Kitchen, built in the 14th century, still stands. Population 6,500.

Glendower (*glĕn'dōōr*), **Owen,** a Welsh chief, descended from Llewellyn, the prince of Wales, was born in Montgomeryshire in 1359. He studied law, served under Richard II, and was body-squire to Henry IV. Shortly after the beginning of Henry's reign some of Glendower's lands were seized by a Lord Gray. After seeking redress from the king without avail, he took up arms independently, seeking to recover his rights and establish the freedom of Wales. He carried on this warfare for years, and in 1402 took Lord Gray prisoner, in the same year also capturing Sir Edmund Mortimer. In 1404 he formed an alliance against England with Charles VI of France, who in the following year sent troops to England. Glendower kept up this war all his life, and is believed to have died after 1415. See Shakespeare's *Henry IV*, Part I.

Glens Falls, N. Y., a town in Warren County, N. Y., on the Hudson River, 45 miles north of Albany and ten miles south of Lake George. It is reached by the Delaware and Hudson Railroad, and has a large trade in lime. It is notable for its splendid water-power, which supplies the town with its electricity and street-railway motor-force, as well as many of its manufactories with the power to run their machinery. It has a number of foundries, machine-shops, sawmills, paper-mills, brick, terra-cotta and lime-works. It has a number of seminaries for women, including the Glens Falls and St. Mary's academies. Population 18,000

Gloucester (*glŏs'ter*), **England,** is situated on the left bank of the Severn River. It was the seat of a nunnery, a monastery and a great Benedictine abbey; the latter was suppressed in 1539, to become, two years later, the cathedral of Gloucester. This cathedral is one of the largest and most notable in England, measuring 420 feet by 144. Its tower rises 225 feet, and contains the bell, Great Peter, weighing over three tons. The city has been the seat of eight parliaments. It has grown into a great commercial port, while its manufactures have somewhat declined. Population 54,683.

Gloucester, Mass., a city situated on the southern side of Cape Ann, founded in 1623; incorporated as a town in 1642; and as a city in 1873, is the leading fishing-port of the New World, being also a port of entry. Six thousand men, manning more than 300 vessels, are engaged in catching fish. Other important industries are granite quarrying, shipbuilding and the manufacture of shoes, boxes, isinglass, glue and also of numerous other articles needed in Gloucester's large fishing business. A daily newspaper, a board of trade, and a master-mariners' league are among the lively evidences of the enterprising spirit pervading the community. The city has ready communication with Boston by steamship and railroad, an average of two steamers and 16 trains running daily each way. As a summer resort, the vicinity of Gloucester furnishes some of the most attractive places along the New England coast,—notably, Magnolia, Eastern Point, Bass Rocks, Long Beach and Annisquam. The city has 23 schools, with 5,000 pupils and 141 teachers. Population, 24,310.

Glove, the article worn to cover and protect the hand, has a history of interest. It was used in early times, and carried with it many meanings and uses. We are told that Laertes, the farmer-king, wore gloves to protect his hands. The Persians were laughed at for wearing them to keep their hands warm. In the Stoic days of Greece and Rome the glove was looked upon as womanish, but later came into use. In the East it was used to pass the title to property, the exchange of the glove carrying possession of the property. In ancient times a challenge to fight was made by throwing down the glove. It became an almost necessary part of dress in England about the 14th century; and during the Elizabethan period gloves were made with gauntlets, on which much rich embroidery was worked. See *Gloves, Their Annals and Associations* by Beck.

Gloversville, N. Y., a city in Fulton County, central eastern New York, on the Cayadutta branch of the Mohawk River, 53 miles northwest of Albany. It is on the Fonda, Johnstown and Gloversville Railroad, and is connected with the New York Central and West Shore roads and with the Erie Canal at Fonda. It has many extensive glove-manufactories, being the center of the United States glove-trade; it does a large trade also in the manufacture and preparation of shoe-leather. It has many good schools and churches, and the Nathan Littauer hospital and a Parsons free library are among its prominent institutions. To its large trade in gloves it owes its name. Population 25,000

Glowworm, the name applied to larvæ and wingless females of certain beetles belonging to the firefly family. They all have the power of emitting light from spots on the abdomen. These spots are yellow by daylight but luminous in the dark. The light, however, is not constant but interrupted; it seems to depend upon the action of oxygen upon a substance produced within the cells that make up the light-giving spots. At all events the light is not due to phosphorus, as is commonly believed. See FIREFLY.

Gluck (*glo͝ok*), **Christoph Willibald** RITTER VON, the first among great modern opera-writers, was born in Bavaria July 2, 1714. He gave no indications of musical genius until, while at the University of Prague, he was forced to teach music to make both ends meet. At last, at 22, he decided to follow the profession, and went to Vienna. Here he was much patronized, and in 1741 he wrote his first opera and six others in the next four years. In 1745 he was called to London by Lord Middlesex, and while there Handel said of him that his music was "detestable." He afterward produced operas in Rome and Naples, being made a Knight of the Golden Spur by the pope, but his triumph was in the production of his *Orphée*. He died of paralysis at Vienna, Nov. 15, 1787.

Glu'cose, Dextrose or **Grape-Sugar.** In chemistry the term glucose is used for a number of sugars occurring in fruits or made from starch, but in popular language it is restricted to the products made from starch, which are most familiar in the form of syrups. In the United States starch-sugar is made from corn, but in Europe the starch from potatoes or rice is used. The usual process is to soak the corn, when that is used, in warm water for three or four days, renewing the water so as to soften the corn without souring it. It is then ground and mixed with water, the thin paste thus made carried through sieves and cleansed with alkali, and the starch finally separated from the water. A bushel of corn makes about 30 pounds of starch. The starch is now ready for what is called conversion, the process by which it is converted or changed from starch to sugar. The starch mixed with water, which has been made acid, usually by the use of sulphuric acid, is boiled for some time; the sulphuric acid is removed by adding chalk; and the liquid is filtered several times. The result either is a clear syrup or a syrup which yields solid glucose when cooled. The clear syrup is the glucose that is used in trade, while the other product is known as grape-sugar, because it is the same sugar as that found in grapes and other fruits. Glucose is used instead of malt in brewing; instead of sugar in canning fruits and making jellies and candy; for making artificial honey; and for adulterating sugar. It is about two thirds as sweet as cane-sugar, and is a cheap and healthful food if properly prepared. In Germany there are about 40 factories, and in the United States about 30, engaged in the manufacture of glucose.

Glumes (in plants), the prominent and characteristic bracts connected with the flower clusters of grasses. See GRASS.

Gnat, a name loosely applied to any one of a group of two-winged insects, including the mosquitoes, midges, buffalo gnat, gall gnat and others. The gnats and midges are mosquito-like in appearance, and commonly mistaken for them. The true mosquitoes are separated from others by having fringe-like scales on their wings and by developing always in the water. See MOSQUITO for life-history and other facts.

Gneiss (*nīs*), a compound of quartz, felspar and mica. This combination occurs in layers of varying thickness, from a mere line to a foot.

Gnostics (*nŏs'tĭks*) [from a Greek word meaning *knowing* or *sagacious*], a term applied to rationalistic or heretical sects in the early Christian church. Their doctrines were a mixture of Greek idealism, oriental pantheistic naturalism and Christian revelation. They held that all natures, intellectual and material, are derived from the deity by successive emanations, which they called *eons*. Christ they deemed a superior *eon*, who had come to the earth to subdue the god or *eon* of this world. They set a higher value upon knowledge than upon faith; thus their view of Christianity was not spiritual, but speculative. Christ's humanity many of them treated as an illusion; nor did they quite believe in his divinity. Their canonical books have little in common with those of the Christian scriptures. Of the gnostics there were more than 50 sects in apostolic times and in the 2d century, when they chiefly flourished.

Gnu, a member of the antelope-group, inhabiting South Africa, with horns bent downward over the eyes and abruptly upward. This animal has an ass-like mane and a horse-like tail. It sometimes is erroneously called the horned horse, but the hoofs are cleft like those of cattle, and it is not closely related to the horse. It is about four feet high and nine long, with a brownish skin. These animals live in herds of from ten to 50. There are two kinds: the common gnu and the brindled gnu; the latter is slightly larger, has horns more like an ox, and has black stripes on the neck and shoulders.

GNU

Goat, a cud-chewing animal related to the sheep, but easily distinguished by having horns wider from before backward, instead of from side to side, like sheep, usually with a beard on the chin and a strong odor. There are numerous varieties both wild and domesticated. The genus (*Capra*) to which they belong includes ibexes and goats proper. Wild goats orig-

ANGORA GOAT

inally were mountain animals. They are found now in Asia and southern Europe. Those of Asia Minor are either solitary or in herds of 30 or more. The female has no beard and shorter horns — being about a foot long — while those of the male reach a length of three or four feet. The original stock of the tamed goats is uncertain. It is likely that they came from the Persian goat or Paseng, but some naturalists think that the wild goats of Tibet and Cashmere come closer to the tame ones. The Angora goat (see illustration), originally of Asia Minor, has long spiral horns and abundant silky hair. Its fleece, called mohair, is in great demand, and the animal is regarded as of high value in various ways. The raising of Angora goats has recently risen to quite an industry in this country on the Pacific coast, and interesting experiments have been made in some of the states of the middle west. There are many breeds of the domestic goat raised for their milk, flesh, skin and wool. The goat of Cashmere and Tibet supplies exceedingly fine wool, used in making Cashmere shawls and other fabrics. Other common varieties of wool-bearing goats are the Nubian and Maltese. The hides of young kids are extensively used for gloves, though much of the so-called kid-leather is an imitation, made from the skins of rats, dogs, etc. See Pegler's *Book of the Goat* and Farmer's Bulletin No. 137, U. S. Department of Agriculture.

GOAT OF CASHMERE

Gobi (*gō′bē′*), **Desert of,** or **Shamo,** in China, is a dry area of plateau lying between the Khingan and Sin-Kiany Mountains. It thus covers a great part of Mongolia. Across this desert lies the great caravan-route between China and Siberia (see CARAVANS). The population consists of nomadic Tartar and Mongol tribes, who pasture their sheep, horses and camels upon the scattered herbage which the desert affords. At times, when rain has recently fallen, this desert takes on an air of great fertility and beauty, being speedily covered with long grass and flowers.

Godavari (*gō̍-dä′vȧ-rē̍*), a holy river, one of the principal streams of India and the largest in the Deccan, rises near the Indian Ocean and flows 898 miles into the Bay of Bengal, which it enters by seven mouths. The beautiful scenery has won it the name of the Indian Rhine. From it branch three canals, irrigating over 528 miles of channel and all along its lower course making the country one of great richness and fertility.

Goderich. In Ontario, a town of 5,000, the most important port on Lake Huron. It is the terminus of the Buffalo and Lake Huron Division of the Grand Trunk Railway. It has extensive salt-works, soap-works and flour-mills. Its trade in fish is considerable. A very popular summer resort.

Godfrey of Bouillon (*bö-yôn′*), a crusader and Christian knight, was born at Baisy, Belgian Brabant, about 1061. He served with great credit under Henry IV of Germany in two of his campaigns. He joined the first crusade and was elected one of the principal commanders. A few days after the capture of the Holy City, he was proclaimed king by the army, but refused to wear a crown where his Savior had worn thorns, and took the title of Defender and Guardian of the Holy Sepulchre. In 1099 he defeated the sultan of Egypt on the plain of Ascalon, thus gaining possession of almost the whole of Palestine; but after a year he died at Jerusalem on July 18, 1100.

Godiva (*gō̍-dī′vȧ*), **Lady.** See COVENTRY.

God Save the King. Commonly ascribed to Henry Carey, who first sang the anthem on a public occasion in 1740. Carey's claim to the authorship of this piece has never been satisfactorily established. But see Dr. W. H. Cummings' book, *God Save the King*, London, 1893, for latest investigations. During the Scottish Rebellion, in 1745, it was publicly sung at the theaters and became well-known. In October of the same year both words and music were printed in *The Gentlemen's Magazine*. The tune has some resemblance to an air of Dr. John Bull's, dated 1619; to a Scotch carol, 1611; to a ballad, *Franklin is Fled Away*, 1669; to a *Lesson* of Henry Purcell's, 1696; to an old anthem, sung at St. James (Catholic) Chapel; and to other compositions less known. In Denmark the tune has been used for the national song, *Heil dir im Sieger Kranz!* Both words and music have been adopted by Prussia and Germany for the same purpose. The tune has been used by Weber in a cantata and in his *Jubel Overture;* by Beethoven in his *Battle-Symphony* and for a set of piano variations; by Attwood in the coronation anthem of George IV; and by Rink in his *Organ-School.* See AMERICA.

Goethals (*gō′thălz′*)* **Major-General George W.,** engineer of the Panama Canal (*q. v.*), was born in Brooklyn, June 29, 1858. He graduated from West Point in 1884, and later from the engineering school of Willet's Point, New York. Before being appointed to the position in which he won international fame as an engineer and civil administrator in the Canal Zone, he had shown his fitness for his great task in the conduct of engineering work for the War Department in various undertakings, including the construction of

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*Commonly pronounced *gu talz′*. Colonel Goethals states the correct pronunciation is as here given.

the Colvert canals in the Tennessee River. He was made Chief Engineer of the First Army Corps in 1898, and later Chief Engineer of the Panama Canal and Chairman of the Isthmian Commission. He was appointed first governor of the Canal Zone.

Goethe (*gẽ'tĕ*), **Johann Wolfgang,** was born at Frankfort-on-the-Main, Germany, Aug. 28, 1749. His boyhood was passed amid pleasant surroundings in study and play until 1765, when he was admitted to Leipsic University. Here his time was given, not so much to the more serious studies, as to art, music and drama, and his first drama in verse, *The Humors of a Lover* (1767), was dedicated to the girl whom he loved. In 1768 he returned to Frankfort sick, and for almost a year he remained an invalid. He sought the consolations of religion, and began the study of alchemy during this illness, continuing this study after his arrival at the University of Strassburg. He received his degree, returned to his native city, but could find no pleasure in the practice of law. While at home he wrote *The Wanderer* and *Wanderer's Storm-Song*. In 1773 he finished *Prometheus* and in 1774 *Erwin und Elmire*, his wonderful work *The Sorrows of Werther* and the tragedy *Clavigo*. He removed to Weimar upon the invitation of the young Duke of Weimar, and in 1776 was made a member of the privy council. After ten years of public labor, during which he wrote very little, he went to Italy for rest, only revising his former work, and *Egmont* and *Iphigenia* were completed, besides some touches being added to *Faust*. The first part of *Faust* was published in 1808. He was greatly interested in science, and among his works are many essays upon botany and other scientific subjects, which are of permanent value. He died at Weimar, March 22, 1832. Goethe is the greatest of German authors, and one of the great poets of the world. His *Faust* has been ranked by scholars with *Hamlet* and *Job* — "the three greatest tragedies." Goethe was a noble-looking man both in youth and in old age. His influence has touched every civilized people, and seems still growing. See *Life* (in English) by Düntzer, by Geo. H. Lewes and by Bielschowsky.

Gog and Magog, names several times used in the Bible and given to the famous figures of the two giants in Guildhall, London. In *Genesis* Gog is mentioned as the son of Japhet, and in *Ezekiel* he is spoken of as prince of Magog, united with others against Israel. In *Revelation* they appear as standing for all enemies of the Kingdom of God. Those in the Guildhall are supposed to be the images of the last two of a race of giants who were conquered by Brut.

Golcon'da, a fortress situated in Hyderabad, India, near which are the ruins of the capital of Golconda, which fell about 1687. The fort is held by a small garrison and serves as a treasury of the Nizam. Golconda is popularly famous for its diamonds, but as a matter of fact they were only cut and polished there.

Gold, a soft, yellow metal. Because of its beautiful color and luster and since it does not become tarnished or corroded in use, it is considered one of the most precious of metals. It is 19.31 times as heavy as water. It melts at 1965° Fahrenheit, a temperature higher than that required to melt copper. Gold has been known from time immemorial, and is widely distributed.

In every ton of sea water there is from .03 of a grain to one grain of gold. Gold is usually found in the metallic or native condition in the form of nuggets or smaller particles, in sand or gravel or distributed through rocks or veins. Nuggets weighing as much as 1,000 ounces have been found. Native gold always contains some silver. The metal is also found in combination with tellurium as telluride ore, and it frequently accompanies copper ores and iron pyrites. The extraction of gold from sands or gravels, called alluvial or placer mining, is accomplished by washing with water in various ways. The heavy gold sinks to the bottom when the material is stirred up with water, and mercury (quicksilver) is usually used to amalgamate the gold and hold it. Solid ores have to be reduced to powder by stamp-mills or other devices before the gold can be extracted, and sometimes they must be heated to redness (roasted) to drive off tellurium or other things. One of the modern methods of extracting gold from ores consists in dissolving out the metal with water containing potassium cyanide. This is known as the cyanide process. Gold is the heaviest of all the familiar metals except platinum. It is more than 19 times as heavy as water. In malleability it stands first among the metals, being capable of being beaten to a thickness of 1/250,000 of an inch and ductile enough to be drawn in a wire 500 feet long and weighing only one grain. It may be alloyed with other metals to change the color for designs. The best known alloy of gold is that with copper, which is used for gold coins.

As a result of the world-wide economic depression which began in 1929, most of the nations of the world abandoned the gold standard, the United States doing so in 1933. This made the "monarch of metals" more precious than ever. In November, 1933, gold was selling at about thirty-three dollars an ounce in United States currency. This, together with unemployment, speeded up the search for the yellow metal to the point where the hills of California, Oregon, and Mexico became alive with prospectors, as did also the deserts of Arizona and Australia, the mountains of Canada, the jungles of the Malay archipelago, the interior of Africa, and the Kolar fields of Mysore in India.

There are many tens of thousands of gold-mining claims staked out all over the world, but only a small fraction of them have ever been worked, and of this comparatively small number still another tiny fraction have ever produced more than $1,000 worth of gold. Many mines, which were long since worked out underground, have in recent years given up a second fortune to those who worked over what was formerly called waste rock or "tailings" from the old mills, extracting with modern methods nearly all the remaining gold.

Since 1492 the earth has given up some $22,937,640,000 worth of the yellow metal, valued at $20.67 per fine ounce. More than half of this was produced since 1902. Of this sum, the United States held in monetary gold in April, 1933, nearly four and one-third millions of dollars, the largest golden treasure ever possessed in the history of the world by any one country. The mine output of the world in 1932 reached the highest point in history—23,911,000 fine ounces valued at $494,000,000. California, which has long been first among the states in production of the precious metal, turned out more gold in 1932 than in any year since the close of the gold-rush period, yielding gold valued at $11,803,000, almost a million dollars more than in 1931.

The Union of South Africa is the greatest gold-producing country in the world, the output reaching 10,000,000 fine ounces a year. Canada is in second place, the United States third, Russia fourth, and Mexico fifth. Australia takes sixth place as a gold producer. The great source of gold in South Africa is Witwatersrand, commonly called "The Rand," which is in the Transvaal. This field was discovered in 1885 and runs for about twenty-five miles on either side of Johannesburg. Gold was discovered in the Porcupine and Kirkland Lake districts of Canada in 1911. Further discoveries in the northwestern part of the Province of Quebec added to the substantial gold production of the Dominion. Since 1930 Canada has produced more gold each year than has the United States.

Most of the early miners used the rocker and pan rather than the drill and black powder. They soon gave way, however, to the giant hose line and "long Toms" of the hydraulic miners who washed down whole hillsides of gold-bearing gravel. More than a billion dollars worth of gold has come from the California placer mines since their discovery, and a third of this amount has been caught in the sluice boxes of the hydraulic miners. Lode mining is quite different from placer mining. When a vein is found, the miners follow it as long as the extraction of ore remains profitable. Far underground drills drive their way into the face of the drift. The resulting holes are filled with dynamite that rips out tons of ore. This is taken to the surface and then to the mill. It is first ground to uniform size and then fed to the stamp mill for fine grinding. Still another method of obtaining gold is by dredging. The most extensive deposit of gold-bearing gravel in North America lies along the Yuba River, at the base of the Sierra Nevada foothills. Huge dredges dig up the banks, extract the gold and distribute the gravel behind them.

See Mining.

Gold Coast, a British crown-colony lying along the Gulf of Guinea on the west coast of Africa. It has an area, including Ashanti and the Northern Territories, of about 80,000 square miles. According to the latest census the population is 2,078,043. The coast line extends about 350 miles. The British formerly had great trouble with the natives of Ashanti. The last revolt occurred in 1900-01. The Gold Coast Colony produces gold, diamonds, cocoa, manganese ore, kola nuts, palm kernels, palm oil, rubber and timber. There are about 275 miles of railway and 2,500 miles of roads. The inhabitants are chiefly Negroes. The climate is not healthful. The soil is deep and rich and will produce a variety of tropical crops. The chief towns are Accra, with 38,000 inhabitants, and Cape Coast Castle with 11,000. See *The Siege of Kumasi* by Lady Hodgson.

Gold Standard, the name given to a monetary system based on gold as the standard of value. When all currency is redeemable in gold at par, a nation is said to be on the gold standard. The use of gold alone as the standard of monetary value is referred to as monometallism in contrast to the acceptance of both gold and silver as the basis, or bimetallism.

The desire for gold has been inherited from our earliest ancestors of which there is record. Since the very beginning of our written history, gold has been the one metal which has been accepted freely in return for services and in exchange for all kinds of property by every race in the world. Gold has always been the world's standard of value, the one commodity for which there has ever been a waiting market, the one substance always accepted, not only without compulsion and without limit as to quantity but as the particular object of universal desire. Over 1,400 years before the birth of Christ, the Greeks used gold for ornaments, but the practice did not originate with them. They had borrowed the custom of wearing gold to add attractiveness to the person from the Egyptians, who had ornamented their women with the precious metal a thousand years before it was ever thought of by the Greeks. Gold having been used as an ornament and valued so highly, it was natural for it to be used later as money. This practice eventually led to its adoption as the standard upon which the monetary systems of many countries were based.

The single gold standard was first adopted by the majority of civilized nations in the nineteenth century. The nations of the ancient world had monetary systems which in a broad sense may be spoken of as based on the double standard of silver and gold. This basis of value was continued until sometime in the Middle Ages. From about the beginning of the seventh century, however, until some time in the thirteenth century, there prevailed a single silver standard. Then the double gold and silver standard was again introduced, and continued to be used until the nineteenth century. Then the leading financiers began to urge the exclusive use of gold as the standard of monetary exchange.

After the Napoleonic Wars, Great Britain was the world's great creditor nation. At that time there was no thought of debt repudiation by nations, and so Great Britain adopted the single gold standard in 1816. It was thereupon necessary for the nations which owed Great Britain money to pay in gold; in many instances gold had to be purchased at a premium with their own money in order for them to make these payments. Other nations were slow to adopt the single gold standard. Portugal was the second nation to line up with Great Britain and adopt monometallism in 1854; Germany followed in 1871; the United States in 1873; Denmark, Norway and Sweden in 1874; the Netherlands in 1875; France and the Latin Union in 1876; Austria-Hungary in 1892; British India in 1893; Japan in 1898, and Russia in 1899. The gold standard was reaffirmed by the United States in 1900. Rumania, Turkey, Serbia and Egypt also established the gold standard. China and Mexico were the two large nations that did not adopt the gold standard during the nineteenth century.

When a nation is at war it is almost impossible to maintain the currency on a firm basis because of the great expansion of credit. The cost of carrying on modern warfare is so great that it has proved to be impossible for the victorious nation or nations to take enough from the vanquished to pay for the expense of the contest. Thus, we find that if a combatant nation uses up great amounts of its material, its men and its credit (in other words, dissipates its wealth in warfare), the value of the money of that nation becomes less in world trade.

France for many years after the World War did not stabilize the franc, but allowed its value to be set largely by what other nations believed to be the conditions and prospects of the French nation. Before the World War, the franc was worth about five to the dollar. In 1926 when Raymond Poincaré became Premier of France, the franc was worth about one-tenth of its pre-war value. By careful management of the affairs of the nation, Poincaré was able to so improve conditions that the franc doubled in value. After it had remained at this point for eighteen months, the French Parliament passed the bill presented by the Premier and on June 24, 1928, the franc was stabilized at a slight fraction under four cents in American money, or about twenty-five to the gold dollar. This gave the franc about one-fifth of the value it had before the World War. All debts of the French nation payable in francs were thereby reduced four-fifths in gold. This strengthened the whole French position.

Great Britain found herself in the same position as France after the World War. British men, money and materials had also been thrown into the war. The British were proud, however, and did not then propose to resort to any such tactics as those of France. In 1925 the British pound was stabilized at its pre-war value of $4.86 gold. Under this procedure the British must pay their debts pound for pound in gold. This probably would have proved to be entirely feasible if it had not been for the breakdown of British industry and commerce, and the establishment of the "dole." The United States had become the world's creditor instead of Great Britain. The world's gold supply began to drift to the United States and to France with its debased franc. Eventually the gold supply of the Bank of England reached such a low point that the situation was untenable, and in 1931 the "National" Government decided to suspend the gold standard and allow the pound sterling to stabilize itself at a lower level. This immediately gave the British a new advantage in foreign trade, allowing British exporters to sell their goods at lower prices in gold standard countries. It also acted as a tariff protection against those countries who remained on the gold standard.

If the nations who had borrowed money from the United States during and after the World War had repaid these debts as they came due, the position of this country would have been so much better that it could probably have remained on the gold standard. This was not done, however, and so to protect American exporters against the competition in foreign trade of those nations with debased currencies and to cause a rise in commodity prices at home, similar action was taken in the United States. An embargo was place on shipping gold out of the country, gold payments were suspended and a program of "controlled inflation" was begun under the leadership of President Franklin D. Roosevelt. In November, 1933, the Reconstruction Finance Corporation began the purchase of gold each day, thus setting the value of the dollar in relation to gold, instead of allowing it to be set by foreign nations. President Roosevelt leaned toward the establishment of a monetary system with the so-called "commodity dollar" as its base, wherein the dollar would not have a fixed value in regard to gold, but for a generation or more it would have a fixed value in relation to commodities. That is, the same number of bushels of wheat would purchase the same pair of shoes year after year. Whether such a system could be achieved could not be foretold at the beginning of 1934. The vested interests were in general strongly opposed to any disturbance of the gold standard under which they had achieved their power. There was agitation in some quarters for a return to bimetallism. Others favored what is known as symmetallism. Nearly all conceded that a return to the gold standard must be accompanied by a devaluation of the dollar.

See Currency; Money.

Golden Age, a term used to describe a period of great prosperity and happiness. Many nations use it to describe the early ages, in which happiness and innocence were thought to have been universal, the traditions of such a period being very common. In Roman literature the golden age was the period from 250 B. C. to 14 A. D., when Livy, Cicero, Ovid, Terence, Cæsar, Sallust, Vergil, Plautus and Horace flourished. The reign of Queen Anne in England is often called the golden age of English literature, with such writers as Dryden, Pope, Addison, Steele, Johnson and Gay. The term is also referred to a future period of prosperity, intelligence and purity — the dream of all mankind.

Golden Fleece, in Greek story the fleece of the ram Chrysomallus, to recover which the famous expedition of the Argonauts set out. The name was given to a celebrated order of knighthood of Austria and Spain, founded by Philip III in 1430. It was instituted for the protection of the church, and the number of its knights was 31, who themselves filled vacancies by vote. In 1713 there was a dispute between Charles VI of Austria and Philip V of Spain for the sole right of conferring the order, but it was settled by giving it to both. The sign of the order is a golden fleece, hanging from a gold and blue enameled flint stone, emitting flames and borne by a ray of fire.

Golden Gate, a passage, one mile wide, forming the entrance to the bay of San Francisco. It is defended by two forts, one outside and one inside.

Gold'enrod, the popular name of a species of *Solidago*, a genus belonging to the composite family. There are about 85 species of goldenrod, most of which belong to North America. They are autumn bloomers, and their characteristic masses of small yellow flowers are prominent features of autumn vegetation. They are associated in relationship and in season with the asters. Being so distinctly a North American flower, the goldenrod is favored by many for adoption as our national flower. In its various forms it adapts itself to all conditions of soils and climates here existing. Only two or three species belong to Europe, but several of our species are carefully cultivated there in gardens. The plant has a prolonged season of blooming; the conspicuous flowers and the ease with which nectar and pollen are to be obtained from them attract many insects. The stem usually is simple and unbranched, resembling a rod; the leaves are generally sessile, long and narrow; the florets grow in clusters along the stem. The flowers have rays, and all the many kinds save one are yellow. This exception is the whiterod or silverrod, its florets being cream-white.

Goldfinch, a small bird with golden plumage, common in the United States and other countries. It is about five inches long, with a cone-shaped bill; in the summer the male is yellow, with a black crown, and wings and tail black and white. This bird and the yellow warbler are often called the yellow bird. It feeds on seeds, especially of the dandelion, thistle and sunflower, and is called the thistle bird. The goldfinches remain over winter in many parts of the United States, but with duller plumage, being grayish brown above with a yellow crown, the under parts a soiled white, and throat yellow. The name is also applied to an European finch that is common in gardens and is a favorite cage-bird. The latter have the forehead and throat blood-red, and a patch of brilliant yellow on the wings. The goldfinch is a gentle, sociable, happy bird; its call cheery; its summer song a flood of melody.

Goldfish, a small ornamental carp, artificially bred in aquaria throughout the world. It originally was a Chinese fish of an olive-green color, but by breeding golden and silver varieties have been produced. Those that have escaped from the fountains in Washington into the Potomac River have produced young that return to the original greenish hue.

Gold'smith, Oliver, the son of a curate, was born in County Longford, Ireland, Nov. 10, 1728. He went to school in the neighborhood and then to Dublin as a free scholar. Here he took part in a college riot and ran away, but his brother arranged matters for his return and he took his degree in 1749. He was intended for the ministry, but the bishop rejected him, and he set out for America, getting no farther than Cork, however, where $250 was given him to study law in London. This he lost in gambling at Dublin, and set out for Edinburgh to study medicine. Unsuccessful in this, he set forth upon a foot-tour through Holland, France, Germany and Italy, returning to England in 1756. He now tried several occupations, all without success. Here appeared his first work, under an assumed name — a translation of *Memoirs* of Jean Marteilhe of Bergerac. In 1759 he published his *Enquiry into the Present State of Polite Learning in Europe*, and began writing for *The Bee*, *The Busybody* and the *Ladies' Magazine*. In 1760–61 appeared his celebrated *Chinese Letters*, republished as *The Citizen of the World.* The next year he published the *Life of Richard Nash* and sold a one third share of his unpublished *Vicar of Wakefield.* In 1764 he earned fame as a poet by his *Traveler*, and two years later the *Vicar of Wakefield* brought him renown. The drama was yet untried, but, before his immense success with *She Stoops to Conquer*, he published his greatest poem, *The Deserted Village*, in 1770. He died at London, April 4, 1774. See *Goldsmith*, in English Men of Letters Series, by Wm. Black.

Golf. An outdoor game, claimed to be of Dutch origin but played in Scotland previous to 1457 and now popular throughout all parts of the British Empire and the United States.

It is played on rather extensive and somewhat prepared grounds called links. The links consist essentially of a course with artificially constructed holes four and a half inches in diameter at intervals of from 100 to 500 yards, each hole surrounded by a smooth surface of ground about 30 feet in diameter called a "putting-green." The object of the game is to drive the small, hard ball, by means of clubs, successively into the 18 holes making up the entire length of the course, in as few strokes as possible. The best ground for a links is a stretch of undulating land or sandy soil covered with short grass. Preferably it should have a number of small streams, holes, gullies, ridges or other natural obstacles and irregularities called "hazards." Much of the skill required in the game consists in so driving the ball that it will not be landed in places where its further progress will be interfered with by these hazards. In case there are not enough natural hazards in the course, artificial ridges called bunkers may be erected at different places along the course. The smoothed surfaces called putting-greens, surrounding each of the 18 holes, are for the purpose of preventing any interference with accurate "putting" for the hole in the center, after the ball has been landed upon the putting-green. A special club called a putter is used for this purpose.

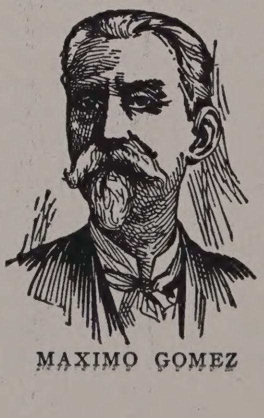
Most players use six or eight different kinds of clubs, each adapted for its own particular kind of stroke. The clubs have a strong, slender handle about three feet in length, often made of hickory, and a strong wooden or iron head with which to hit the ball. In beginning a game, and also in starting out for another hole after one hole has been reached, the ball may be placed upon a little elevation of sand or cone of india-rubber. to give the player a chance to get a good square hit at it. This little elevation is called a "tee." In knocking or "driving" a ball from a tee, a club called a driver is usually used. It has a long handle and a wooden head, and is especially adapted for driving the ball a long distance. Two hundred yards is considered a good drive. Should the ball get into a slight depression along the course, a club called the brassy, very much like the driver but rather better adapted for raising the ball, is generally used. Its head is tipped with brass. There are various other clubs, such as the mid-iron, cleek, mashie, lofter, etc., especially adapted for extricating the ball from long grass ruts, etc. or for lifting it so as to land it accurately in a certain spot, rather than to drive it a long distance.

The balls are now made for the most part of gutta-percha. They are 1¾ inches in diameter, hard enough not to be easily cut by the clubs, and heavy enough to carry a long distance.

There are two principal methods of scoring, namely, by match play and by medal play. In match play the players drive in turn from the tee at the starting place, and the stroke is then taken by the one whose ball is farthest from the hole aimed for, until all the players have "made" the hole, that is, played their ball into it. The player making the hole in the least number of strokes wins the hole, and the one who wins the greatest number of holes in going round the entire course wins the game. In medal play each player keeps track of the number of strokes he took to complete the entire course, and the one who completes it with the least number of strokes wins, no matter whether he won the most holes or not.

Although the game was introduced into England from Scotland in the early part of the seventeenth century, it was not played extensively in England till after 1864. It was started in New York about 1890, and then taken up rapidly throughout America generally. On account of the expense involved in providing and in keeping up the links, in paying caddies for carrying clubs, hunting up balls, etc., the game has a tendency in some places to be limited more or less to wealthy persons; but where the rent of suitable land is not high, this need by no means be the case.

Gomez (*gō′mās*), **Maximo,** Cuban patriot and soldier, was born at Bani, San Domingo, Aug. 25, 1826, of Spanish parents, and early in life served in the Spanish army. In 1868, when the ten years' war in Cuba broke out, he ranged himself on the insurgent side, and on the death of General Agramonte commanded one of the departments into which the island was divided, and fought at Las Guasimas. In



MAXIMO GOMEZ

1895, when the new struggle broke out, he with Antonio Maceo led the insurgent ranks, captured Fort Jaruco and destroyed it, and strove to make Cuba a desolation to the Spanish. Gomez, who among his fellow-patriots had the reputation of being an able soldier and clever strategist, spent much time in exile. He died on June 17, 1905.

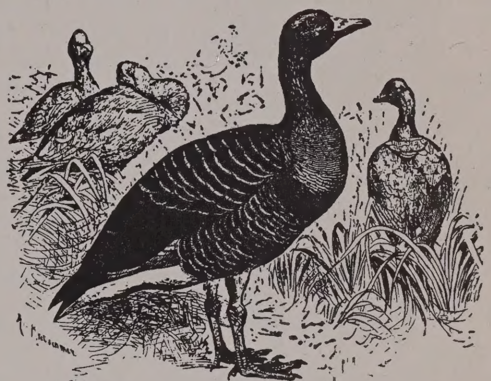
Gom'pers, Samuel, president of the American Federation of Labor, was born in London, England, Jan. 27, 1850, where he received his education at a night-school. He learned two trades, working first as a shoemaker and afterward as a cigarmaker. Early in his career he came to the United States, where he became a zealous advocate of the rights of labor and interested in efforts looking to the ameliorating of work-people of every class. He was one of the founders of the Federation, and after 1882, with the exception of the year 1894, was continuously its president. Under his direction the Federation became the most powerful labor organization in the United States. For the most part its influence on political affairs has been indirect, but has been particularly noticeable in such matters as the agitation for a shorter working day, in supporting employers' liability laws and other legislation designed to improve the position of the working man, and in promoting the closed shop. Gompers, especially in later years, consistently opposed the radical or socialistic elements in the Federation. He argued that industrial conciliation, not direct action, was the means by which the workman should gain his ends. He died in 1924.

Gonsalvo de Cordova (*gō̇n-säl'vō̇ dā̇ kôr'-dō̇-vä*), **Hernandez,** a great Spanish general, styled The Great Captain, was born near Cordova, Spain, Mar. 16, 1453. He served against the Moors and Portugal. For his masterly services against Boabdil, king of the Moors, Spain granted him a pension and a large estate. He was next sent to aid Ferdinand II of Naples, and conquered the greater part of the kingdom, with Ferdinand completely driving the French from Italy. On his return to Spain in 1498 he was rewarded by being made Duke of San Angelo. He again set out for Italy, wrested some cities from the Turks, and in 1503 completely defeated the French. He was made viceroy of Naples, but was recalled to Spain and fell from favor. He died on Dec. 2, 1515, at Granada. See Prescott's *Ferdinand and Isabella.*

Good Friday is the name of the Friday before Easter, so named to commemorate the crucifixion of Christ. In the Roman church it is observed by a solemn service, the worshipers approaching the cross on their knees to kiss the image of Christ. It is also observed by the Episcopal church.

Good'rich, Samuel Griswold, an American author, known best by his pen-name of Peter Parley, was born at Ridgefield, Conn., Aug. 19, 1793. During 1828–42 he published *The Token* in Boston, contributing tales, poems and essays. He published some two hundred volumes, mostly for the young. He died at New York, May 9, 1860.

Goodyear, Charles, was born Dec. 29, 1800, at New Haven, Conn., failed as an iron-manufacturer in 1830, and in 1834 turned his attention to perfecting a method of making rubber, which before his era always softened in warm weather. After much ridicule and suffering he succeeded, and in 1844 took out a patent for vulcanized rubber. He continued to find new uses for rubber, until it required sixty patents to cover his inventions, besides gaining for its inventor prize-medals and the cross of the Legion of Honor. He lived to see vulcanized rubber used in over five hundred ways, and its manufacture giving employment to over 60,000 workmen in the United States, France, Germany and England. He died at New York, July 1, 1860. See Pierce's *Trials of an Inventor.*



GRAY-LAG GOOSE

Goose, a bird with webbed feet, belonging to a group embracing swans and ducks, but commonly larger than a duck and smaller than a swan. The Canadian goose is the kind commonly seen in the United States, the birds that, in passing over, fly north in the spring and south in the fall in V-shaped order, led by an old gander. It usually breeds in the northern portion of the continent, but has been known, rarely, to breed within the limits of the United States.

The Canada Goose is also called Wild Goose, Gray Goose and Honker, its mellow honk, honk a familiar sound. It is very large, from 36 to 43 inches in length, its head and neck are black, the plumage grayish-brown above, pale gray beneath. Far from haunt of man, in deserted osprey's nest in tree-top, or in remote marsh or on wide plain the Canada Goose lays her eggs, buff-colored, four or five in number. The Canada Goose is the most abundant of all the wild geese. The Gray-Lag Goose (see illustration) is the corresponding European form and is regarded as the wild stock from which tame geese have been derived. The American White Fronted Goose, Prairie Brant, Gray Brant or Laughing Goose, is a wild goose familiar on the Pacific coast and in the interior, but rare in the east. It migrates in the spring and autumn, utters a resounding cackle. The Snow Goose, a splendid bird but fast disappearing, very rare in the east, is clothed in plumage all snow-white save for gray wing-coverts and blackish wing-tips. It migrates in spring and fall. The Brant or Barnacle Goose is common on the Atlantic coast. The upper plumage is black and brownish-gray; lower breast whitish, upper part of breast black. It is fond of the sea, usually migrates over the water, is seldom seen far inland. At low tide the birds wade about the marshes feeding, the young ones eagerly hunted by the sportsmen. A very similar bird, the Black Brant, belongs to the west.

Goose′berry. Plants which, associated with currants, form the genus *Ribes*, which contains about 60 species, chiefly natives of north temperate regions. Over 50 species are found in North America, about 40 of them being western. The gooseberry is said to have been cultivated for only about 300 years, and chiefly in England, where numerous magnificent varieties have been developed. In America their culture has been much neglected. There are two general types in cultivation: The European (*R. grossularia*), with thick glossy leaves and large variously colored fruit; and the American, with thinner leaves and small reddish-green fruit shading to purple.

GOOSEBERRY

Goph′er, a small burrowing rodent, the name used differently in different localities. Gophers do much damage to vegetation, and are considered a great pest by the farmers. The Red Pocket-Gopher commits its depredations in the fertile prairie region of the Mississippi Valley. It is about as long as a small rat, the body considerably thicker; in the skin of the cheek is a large pocket or pouch in which to carry its store, on each forefoot a set of long claws. The word gopher is a corruption of the French *gaufre*, meaning honeycomb. Natural enemies are the weasel and the gopher-snake. Farmers try to keep their numbers down by traps and poison. The name gopher is applied also to the ground squirrels, the spermophiles (seed-lovers); a familiar species is the little animal whose back and sides are marked with stripes of dark brown and yellow, the brown stripes having conspicuous yellow spots. It ranges north into Canada, south as far as Texas, but is not found west of the Rockies. It burrows into the earth below the frost line, carries seed in its pouches for storing in its burrow, and sleeps during the coldest weather.

Gor′dian Knot. The Phrygians, looking for a king, were told by the oracle of Delphi to choose the first person riding in an ox-cart toward the temple of Jupiter. This person was a poor peasant named Gordius. He dedicated his oxen and cart to Jupiter, and tied the yoke with a hard knot, and the oracle declared that whoever should unloose the knot would be ruler of Asia. When Alexander the Great came to Gordium, where the oxen were, he cut the knot with his sword and applied the prophecy to himself.

Gor′don, Charles George. England's glory and England's shame is "Chinese" Gordon, "Gordon Pasha," "Gordon the Christian Hero"—England's glory that it gave such a man birth and had his life-long, devoted service, and England's shame that she sent him to his death. It was a nation's criminal blunder that left him to perish at Khartum, and the nation paid for it with fifteen years of warfare with savage fanatics, thousands of lives and hundreds of thousands of treasure.

Son of Lieut.-Gen. Henry W. Gordon of the royal artillery, this modern Sir Galahad of stainless fame was born at the military post at Woolwich, England, Jan. 28, 1833. At twenty-one, as a lieutenant in the royal engineers, he was in the Crimea. In the battle of Balaklava, famous for the charge of the light brigade, young Gordon won British and Turkish medals and the French order of the Legion of Honor, for conspicuous bravery, together with the rank of captain. In 1860 he commanded the royal engineers in the allied armies in China and was made a brevet-major. Then he was called to Shanghai to help defend that British post against the Taiping rebels. The rebellion was of so barbarous a character and the Chinese government so helpless, that the British in Shanghai raised an army at their own expense and placed Gordon in command of it. Governor Li Hung Chang, the great Chinese statesman, created him a mandarin. After two years' hard fighting in 30 battles, the rebellion was stamped out, but it sprang to life again when Governor Li treacherously murdered the leaders who had surrendered under Gordon's promise of amnesty. Governor Li had to publicly acknowledge responsibility for this act, and promise to abide by Gordon's terms, before that Christian hero would again take the field. He rode always at the head of his troops, his only weapon a small cane of light wood. He was never wounded and he was believed to bear a charmed life from his magic wand. Surrendered rebel bands enlisted under his banner. He wore the yellow jacket and peacock feather and had the highest military rank in China. The rebellion was crushed, and "Chinese" Gordon went back to England with world-wide fame, but as poor in pocket as when he entered China. The 10,000 taels in silver sent him by the emperor he turned over to the British Museum. They lie there to-day, in a glass case, a pile of tarnished coins, beside his maps of the campaigns, his jacket and feather. The act was typical, for he ever treated money and honors with contempt.

The next six years he spent in routine duty at Gravesend, constructing engineering works on the Thames and spending his pay on the poor and sick. He was unmarried, but he kept up a home where he housed many a river waif and fitted him out for the sea or a trade. In 1874 he went out to Khartum as governor of the equatorial provinces of Africa which belonged to Egypt. He opened a mail route from Cairo to Albert Nyanza (2000 miles), fortified posts and placed Egyptian garrisons in them and tried to break up the slave-trade. To this end the Khedive added the Sudan to his dominions. He made himself personally known in all that vast region. The slave-trader feared him; fanatic Moslem chiefs loved him. A son of the desert he learned to live in tents and to sleep on the backs of camels. When satisfied that the slave-trade was carried on by connivance with the government at Cairo, he resigned, rebuking the Khedive as he had Governor Li.

At fifty he was back in London, a major-general, unemployed. Commissions were offered him in China, in Cape Colony, in the Congo State. He resigned them all when, matters having become intolerable in Central Africa, the British Government demanded that Egypt should withdraw and turn the Nile provinces and the Sudan over to England. There was but one man in England for the task of subduing and ruling that vast kingdom of sand. Gordon had been gone several years. He was not forgotten, but a new leader had appeared in the Mahdi, and England was not prepared for the task she so lightly undertook.

Gordon arrived in Khartum in February of 1884 without troops. He got 2,500 Christians down the Nile to safety before he was shut in. The siege began in March. In April the telegraph wires were cut. In that month a relief expedition was talked of in Parliament, but nothing was done. The Nile rose to summer flood and slowly subsided. With no more than a dozen European assistants, Gordon turned river steamers into ironclads, laid mines, strung wire entanglements, executed sorties, kept up the spirits of the besieged, baffled fanatic foes for ten months. The sun burned above shrinking river and lost leagues of shimmering sand. Famine and pestilence walked in the doomed city; the grip of fanatic foes tightened. To this day the silence, the indifference, the paralysis of the government are inexplicable. For months England abandoned her best defender.

Lord Wolseley left London in September, but the delay was fatal. The Nile had gone down and boats went aground on the shallows. Khartum fell on the 26th of January, 1885; the relief arrived on the 28th. A general massacre had taken place, and Gordon's head was carried to the Mahdi's tent. No trace of his body was ever found. His diary and last letters were recovered. In one to his sister he said: "It must soon be over. I am quite happy. I have tried to do my duty." Not a word of reproach or complaint. Numerous monuments have been erected to him, but his best memorials are Gordon College in Khartum and the Gordon Boys' Home in London. The Sudan was not conquered until 1900. (See KITCHENER). Tennyson wrote the epitaph for the tomb in Westminster Abbey. See *Chinese Gordon* by Archibald Forbes and *Life* by H. W. Gordon.

Gordon, Charles W. (Ralph Connor), was born at Indian Lands, Glengarry, Ont., in 1860, the son of a Presbyterian clergyman. He was educated at the University of Toronto, Knox College, Toronto (in theology) and at New College, Edinburgh. He was missionary in the Rocky Mountains from 1890 to 1894, visiting Great Britain in the interest of Canadian western missions and securing aid and interest, and has been minister of St. Stephen's Presbyterian Church in Winnipeg since 1894. His exceedingly popular tales of life in the wilderness are characterized by manly and fervid Christian feeling, and have had the widest circulation in Canada, Great Britain and the United States. They include *Black Rock*, *Beyond the Marshes*, *Given's Canyon*, *The Sky Pilot*, *Ould Michael*, *The Man from Glengarry*, *Glengarry School Days*, *The Prospector* and *The Doctor*.

Gordon, D. M., was born in Pictou, Nova Scotia, in 1845, and educated there and later at Glasgow and Berlin Universities. Ordained in 1866, he assumed charge of St. Paul's Church, Truro, Nova Scotia; removed to St. Andrews, Ottawa, in 1867;

and in 1882 went to Winnipeg and became pastor of Knox Church. In 1887 he removed to St. Andrew's, Halifax, and in 1894 was appointed professor of theology in the Presbyterian College. He succeeded the Rev. G. M. Grant as principal of Queen's University, Kingston. He still holds and fills successfully that very important and responsible position.

GEN. J. B. GORDON

Gordon, John Brown, was born in Upson County, Ga., Feb. 6, 1832. When the Civil War broke out, he joined the Confederate side and won his way up from captain to major-general, and was eight times wounded in engagements, and severely at Antietam. From 1873 to 1880 and from 1891 to 1897 he was a United States senator. From 1887 to 1890 he was governor of Georgia. He died in 1904.

Gorgas, William C., whose great work in stamping out malaria and yellow fever and establishing modern sanitary conditions is referred to in our article on the PANAMA CANAL, was born in Mobile, Ala., Oct. 3, 1854. He was a graduate of the University of the South and of Bellevue Medical College. He entered the Medical Department of the Army in 1880 and was made Colonel in 1903 by Congress for his service in establishing sanitary conditions in Cuba. In 1914 he was appointed Suregon General of the Army with title of Brigadier General. He died in 1920.

Gor'gon, a frightful female monster supposed to have lived in the lower regions, according to Homer; in the western ocean, according to Hesiod. There were three gorgons, according to Hesiod, but Medusa was the most frightful. They were represented with wings, brass claws and having serpents for their hair and girdles. A later story says that Medusa was a mortal changed by Minerva, so that whoever looked upon her was turned to stone. She was killed by Perseus, and her head placed in the shield of Minerva.

GORILLA

Gorill'a, the most manlike of the apes, a native of the dense forests of west-central Africa. Old males reach a height of five feet and six or eight inches. They more frequently assume the erect position than the other apes. Their bodies are covered with very dark gray hair, intermingled with a few red hairs. They live in pairs, with their offspring, rather than in troops. They have flat noses and very prominent ridges over the eyes, and their facial expression is hideous and brutal. They are very ferocious. They feed upon berries, sugarcane and other vegetables. Very few people have seen a living gorilla, as they have not been exhibited in zoological gardens A young one was exhibited in Berlin and attracted much attention. For the structural relationship of apes with man see APE.

Gor'ky, Maxim, the pen-name of Alexi Mamimovitch Pyeshkoff, a Russian author, born at Nizhni Novgorod in 1868 After being variously employed in different parts of southeastern Russia as shoemaker, gardener, ship's cook, baker, porter and lawyer's clerk, he finally travelled as a tramp over a large part of Russia. The experiences met with in these wanderings furnished the basis for most of his subsequent literary work. He has won an international reputation through his stories dealing chiefly with the tragedies in connection with the life of the lower classes. His first story of note, *Makae Schudra*, appeared in 1892.

Gor'man, Arthur Pue, United States senator from Maryland and president of the Chesapeake and Ohio Canal Company, was born in Howard County, Md., March 11, 1839, and educated in the public schools of his native county. From 1852 to 1866 he served as page in the United States senate and was appointed postmaster of the senate. He was subsequently collector of inland revenue for the fifth district of Maryland, a member of the Maryland legislature, speaker of the house and state senator. He was elected to the United States senate in 1880, taking his seat in the following year, and was re-elected in 1886 and again in 1892. After 1898 Mr. Gorman was in forced retirement until 1903, when he returned to the United States senate for the term 1903–09. But he died on June 4, 1906. During much of the period that he was in the United States senate he was the dictator of politics in Maryland and the Democratic leader of the senate.

Gortchakoff (*gôr-chä-kof′*), **Prince Alexander Michaelovitch,** a Russian statesman, was born at St. Petersburg, July 16, 1798. He was educated at the Lyceum of Tsarskoe-Selo, and became experienced in diplomacy under Nesselrode, whom he succeeded as minister of foreign affairs. In 1854–56, while minister to Austria, his efforts were instrumental in passing the Treaty of Paris. In the Polish rebellion of 1863 he decried foreign interference, and said that Russia should be allowed to settle her own internal affairs. For his decided stand in this matter he was made chancellor of the empire in July, 1863. He was known and admired throughout Europe, and was the most notable diplomat until the height of Bismarck's popularity. He was a member of the Berlin congress in 1878, and died at Baden-Baden, March 11, 1883. See Julian Klaczko's *Two Chancellors.*

Gos′nold, Bartholomew, an English navigator and an early explorer of New England. In 1602 he sailed to America in the *Concord* with the idea of founding a permanent colony. He touched the coast of Maine, discovered and named Cape Cod, Martha's Vineyard and Elizabeth Island, now Cuttyhunk, and at the last-mentioned place attempted to found the colony. The difficulties of pioneer life and the hostility of the Indians soon made all hands discouraged, and they returned to England laden with a cargo of furs, cedar and sassafras.

In 1606 Gosnold was influential in securing a charter from James I, for the purpose of establishing a colony in Virginia. The following year three ships were sent out, carrying 105 adventurers as prospective colonists. Jamestown was founded, but the settlement was unsuccessful, Gosnold with many others being carried off by disease before many months had passed away in the new colony.

Gosse, Edmund William, English poet and *littérateur*, was born at London, Sept. 21, 1849, and was at an early age assistant-librarian at the British Museum and lecturer in English literature at Trinity College, Cambridge. In 1904 be became librarian of the House of Lords. He has written, besides several volumes of dramas and verse, lives of the poets *Gray*, *Donne* and *Congreve* the dramatist; *Northern Studies; Seventeenth-Century Studies; History of Eighteenth-Century Literature; History of Modern English Literature; Gossip in a Library; The Secret of Narcisse; The Jacobean Poets; From Shakespeare to Pope;* and *Life of Jeremy Taylor.*

Gosse, Philip Henry, British zoologist, was born at Worcester, England, April 6, 1810, and died at Torquay, Devon, Aug. 23, 1888. His early life he spent in Newfoundland, after which he spent three years as a farmer in western Canada and a year in Alabama as a school-teacher. He then went to Jamaica for a short while, where he developed his tastes as a naturalist, and returned to England, where, with the exception of a further brief visit to the West Indies, he settled down to literary work, and, in 1856, was elected a fellow of the Royal Society. His publications embrace *Letters from Alabama, The Canadian Naturalist, Birds of Jamaica, A Naturalist's Sojourn in Jamaica, Text-Book of Zoology, A Naturalist's Rambles, The Aquarium, Handbook of Marine Aquarium, Marine Zoology, Evenings at the Microscope, Romance of Natural History* and *Land and Sea.*

Go′tha. See SAXE-COBURG AND GOTHA.

Gothenburg (*gŏ-′tĕn-bōōrg*), the city of Sweden next in size and importance to Stockholm, stands near the mouth of the River Gota. The town is built upon a plain beside the river, while its suburbs extend along the slopes of the surrounding hills. Gothenburg is an important center of trade and manufacture. It exports iron, steel, machinery, zinc, lumber, oats, sailcloth, fish and leather. The city was founded in 1618–9 by Gustavus Adolphus. Among social reforms the town is noted for its regulation of the saloons. Its present population is 167,813.

Goths, the name of a Teutonic people whose earliest known home was on the southern coasts and islands of the Baltic. The history of their southern wanderings is unknown, but in the 3d century they were living north of the Black Sea, their ranks greatly swollen by many conquered tribes. Those farthest east became known as Ostrogoths (East Goths), those farthest west as Visigoths (West Goths). In the reign of King Ostrogotha (248–49) war was waged against the Romans, who were routed at the battle of Abritta. For 18 years the eastern Roman provinces were ravaged by the Goths, but they were defeated by Claudius, and in 270 were given the province of Dacia by the Emperor Aurelian. So the Visigoths settled in Dacia, while the Ostrogoths remained in southern Russia. In the middle of the 4th century the Ostrogothic king, Ermanaric, carved out a powerful kingdom reaching from the Black Sea to the Gulf of Bothnia. In 375 this kingdom was overthrown by the Huns, while a few Ostrogoths with the Visigoths crossed the Danube and placed themselves under the protection of the Romans. Later on, the Visigoths were granted lands in Thrace and the Ostrogoths in Phrygia. They had their own laws and 40,000 of their warriors were organized into a highly paid, separate army. These Goths, who became part of the Roman empire, had for the most part become Christians, probably because of the 40 years' labor among them of the apostle Wulfila, himself a Goth. After the death of the able Emperor Theodosius (395), the Visigoths rose in rebellion under their young king, Alaric. Though held somewhat in check by Stilicho, on the death of that great general Rome was three times besieged. Twice the city was saved by agreeing to Alaric's terms, but the third time it was given up to plunder. The whole nation, not merely the army, had followed Alaric in his wars, and, when his death made the conquest of Italy seem impracticable, they migrated to southern Gaul and soon spread over nearly the whole of Spain. The Visigothic kingdom of Toulouse, as it was called, was founded in 418, and came to include the greater part of Spain, Provence and all of Gaul south of the Loire and west of the Rhone. The most noteworthy happening in the history of this kingdom was the great battle in 451 near Troyes, often called the battle of Chalons, in which the Visigoths, under their king, Theodoric I, joined with the Romans and Franks in crushing the Huns under Attila. This battle destroyed the Hunnish empire and kept Europe from being overrun by these savage hordes. In 507 the battle of Voclad was won by the Franks under Clovis, and the Visigoths were forced beyond the Pyrenees. The great Ostrogothic emperor, Theodoric, and his general, Theudis, for a time really ruled the Visigoths, and afterward the only king of importance was Leovigild, who made Toledo his capital, and conquered Portugal and the northeastern part of Spain. All we know of Roderic, "the last of the Goths," so famous in story, is that he was defeated in 711 on the banks of the Guadalete by the Moorish invaders. Under the pressure of the Moorish yoke all the Christians on the peninsula became united into one nation, when the Goths were no longer heard of as a people; but the Spanish nobles have always claimed to be descendants of the Goths.

The Ostrogoths, who had been overthrown by the Huns in the 4th century, adopted the wandering life of their conquerors and formed part of the vast horde which followed Attila the Hun to Gaul. When the Hunnish empire fell, they became independent and settled near Vienna. They soon became the mercenaries or hired soldiers of the eastern empire. But later, driven by famine, they migrated to the southeast, ravaging Mœsia and Thrace. In 474 the young Theodoric, who when a boy, had been sent to Constantinople as a hostage and had there been educated as a Roman noble, became king of the Ostrogoths. After 14 years of warring, he was given permission to conquer Italy from the usurper Odoacer. The whole nation, numbering probably a quarter of a million, followed him on his five years' conquest. Theodoric's long reign as ruler of Rome till his death in 526 was one of the ablest and best in Roman history. But under the eastern emperor, Justinian, the generals, Belisarius and Narses, reconquered Italy. The Goths fought their last battle at Mons Lactarius, near Vesuvius, in 552. Narses allowed the defeated army to march out of Italy, and what became of it is unknown. The Ostrogoths had ceased to be a nation.

The Gothic language belongs to the east Germanic group, which includes the Scandinavian, while the west Germanic group includes Old English and Low and High German. As the Bible translated by Bishop Wulfila is several centuries older than the earliest writing which we have of any other Teutonic language, the value of Gothic in the study of the early Teutonic languages is very great. For Gothic architecture see ARCHITECTURE. See Henry Bradley's *The Goths to the End of the Dominion in Spain* and Gibbon's *Rome*.

Göt″terdäm″merung. The concluding piece in Wagner's *Der Ring den Niebelungen*. First performed at Bayreuth, Aug. 17, 1876. *Der Ring* is a complete exposition of Wagner's artistic principles. The other parts of this tetralogy are *Das Rheingold*, *Die Walküre* and *Siegfried*. As in Wagner's other works, the poetical text was written by himself.

Gottingen (*gĕt′tĭng-en*), a city in the former kingdom of Hannover, Prussia, containing a few ancient buildings, one, the Jacobikirche, having a steeple 320 feet in height. It was made a town in 1210, and suffered much in the Thirty Years' War. Its famous university was founded in 1734, and now has 149 professors, 1,149 students and a library of 500,000 volumes and 6,000 MSS. Longfellow, Bancroft and many other illustrious Americans studied here. Population 35,000.

Gottschalk (*gŏt′shälk*), **Louis Moreau,** American pianist and composer, was born at New Orleans, La., May 8, 1829, and died at Tijuca, Brazil, Dec. 18, 1869. In his youth he manifested marked musical ability, and was sent to Paris to pursue his studies. His first appearance in public as a pianist was in 1845 in Paris, where he gave promise of the distinction and favor with which he was later regarded. He then returned to the United States, where he made the round of the chief cities, giving piano recitals. He also wrote many compositions for the piano, including a cantata, and a symphony entitled *Night in the Tropics*.

Gough (*gŏf*), **John Bartholomew,** lecturer, was born in Kent, England, Aug. 22, 1817, was sent to America at the age of 12, and found work on a farm. He afterward went to New York city, finding employment in the Methodist Book Concern. He lost his position through dissipation and drunkenness. In 1842 a Quaker induced him to sign the pledge, and he soon afterwards determined to spend his life in temperance work. He lectured with great pathos, humor and earnestness throughout America. The power of his oratory over his hearers was great, as was also his success in winning drunkards to a sober life. In 1853 he was engaged by the London Temperance League, and spent two years in lecturing in England, and again went to England in 1857 and 1878. He died at Frankfort, Pa., Feb. 18, 1886. See his *Sunlight and Shadow.*

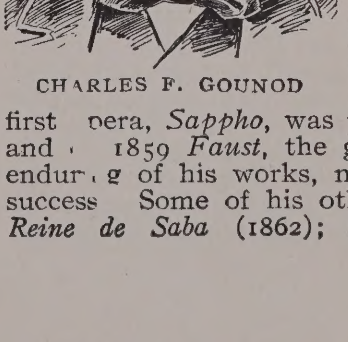
Gould, Benjamin Apthorp, was born at Boston, Sept. 27, 1824, and graduated from Harvard in 1844 and from Göttingen University, Germany, in 1848. On his return to America he conducted the *Astronomical Journal* for 12 years; was director of the Dudley Observatory; and the first to determine the difference in longitude between America and Europe with mathematical exactness, In 1868 he was given charge of the National Observatory at Cordoba, in the Argentine Republic, and there mapped out a large part of the southern heavens. He returned to the United States in 1885. He published some valuable astronomical reports and charts, and died at Cambridge, Mass., Nov. 26, 1896.

Gould, Jay, American financier, was born at Roxbury, N. Y., May 27, 1836, and died at New York Dec. 2, 1892. He is an interesting example of the American self-made man, for, with little education and no advantages from family connections or other aids, he acquired a commanding place in the American financial world and died leaving an estate estimated at over seventy million dollars. Brought up on his father's farm, he had but little schooling; yet what he obtained at Hobart Academy showed him to possess a taste for mathematics and surveying. The latter he himself early put to use in conducting surveys, which enabled him to engage for a time in the lumber business and later to acquire an interest in a bank at Stroudsburg, Pa., and the bonds of a railroad. These investments turning out well, he established himself as a broker in New York city. He later acquired controlling interest in the Erie Railroad, and was for a time its president, and subsequently became a heavy operator in the stock of the Pacific and other railroads, eventually forming what became known as the Gould system, aggregating some 13,000 miles of railway plant. He also became financially interested in the New York elevated railways and in the Atlantic, Pacific and Western Union telegraph companies, which added their quota to his colossal fortune.

Gould, Helen Miller (Mrs. Shepard), is America's Lady Bountiful who has been compared with England's noble Lady Burdett-Coutts. Born in 1868, the oldest daughter of Jay Gould, she became, on the death of her mother, her father's close companion and adviser. At the age of 24 she inherited a fifth of his estate of $70,000,000, and was named one of its executors. To fit herself for these duties she took the full course in a law school. Her brothers and sister married, she retired to her country home, Lyndhurst, on the Hudson, and devoted her life and fortune to benevolence. So quietly did she go about her good work, however, that the world heard little of her until the opening of the Spanish-American War, when she gave the United States Government $100,000 for national defense; and went in person to Camp Wykoff, Cuba, to superintend the distribution of $50,000 worth of comforts to sick soldiers.

As Miss Gould, at Woody Crest, on her Hudson River estate, she built and maintains a vacation home for the children of New York's slums. She supports beds in the Babies' Shelter, gives free scholarships to poor, promising students, and obtains positions for a number of boys and girls. Her mail is so large as to require a private secretary. Many requests for help must be refused; worthy objects of benevolence she personally investigates. It was after a visit to the district around the Brooklyn Navy Yards, that she built the Y. M. C. A. clubhouse to keep "Jack Ashore" from temptation.

Under the medium height, dark-haired, dark-eyed, shy, the lady of Lyndhurst dresses simply and is unknown to society She works as hard as if she had to make her living, and says that nothing seems to her so pathetic as idleness and the lack of some worthy absorbing interest. Russell Sage said that she is a splendid railroad man.



CHARLES F. GOUNOD

Gounod (*goo'nō'*), **Charles François,** an eminent composer, was born at Paris, June 17, 1818, and studied music at the conservatory there, afterward going to Rome to complete his education. While at home he gave his time mostly to sacred music. The first work to bring him any notice was the *Messe Solonnelle.* His first opera, *Sappho,* was produced in 1851, and in 1859 *Faust,* the greatest and most enduring of his works, met with immense success Some of his other works are *La Reine de Saba* (1862); *Romeo et Juliette*

(1867); and *Le Tribut de Zamora* (1881). He was a member of the Institute of France and a commander of the Legion of Honor. He died on Oct. 18, 1893.

Gourd. This common name is applied to the small hard forms of *Cucurbita pepo* which are ordinarily used for ornamental purposes. In England, however, it is a name applied to species of *Cucurbita* in general. In America the various forms are designated as gourds, pumpkins and squashes. The common pumpkin (*C. pepo*) is probably native to tropical America, but is not known wild. It was found cultivated by the Indians along with maize when America was discovered. The various forms of crookneck squashes (*C. moschata*) are said to have been derived from eastern Asia. The ordinary squash (*C. maxima*) is probably American. The genus contains about ten species, but innumerable varieties have been cultivated.

Gov'ernment, a term that may be broadly used to indicate any kind of system for the regulation of conduct, in most cases refers to state, county, township or city control over the conduct of citizens. According to Aristotle and the Greek tradition, there should be three kinds of government. It may be monarchic, resting in the hands of one individual. It may be aristocratic, and rest in the hands of the few. Or again, it may lie in the power of the many or be democratic. But modern governments are not so simple. England, for instance, is a monarchy; yet England is governed by the many. A more valuable classification of governments arises out of the distinction between the power and duty of making laws and the power and duty of carrying them out. The former is the office of the legislature, the latter of the executive. In presidential systems, like that of the United States, these are somewhat independent of one another. Both rest equally upon the sovereign state or nation. But in parliamentary systems, like that of Great Britain, the executive depends upon the body that legislates; and its members resign their offices the moment that the majority in parliament may have turned against them. It is doubtful which plan is the better.

Within the government of the state there is need of a complex system of local government to meet the needs of cities and of the smaller divisions of the country. Local governments, as in Russia, often grow up without reference to the central government. But except in the case of *federations*, such as the United States, Germany, Australia and Canada, the local governments have only such powers as the central government grants or permits them. The states of a federation, however, share in the supreme powers of government. In some cases, such as the United States and Australia, they retain all powers which the constitution does not specifically vest in the central government. In the Canadian type of federation, on the contrary, the powers of the states are enumerated, and all else falls within the dominion of the federal government.

State government in the United States is provided for according to Article X of the amendments to the constitution, which declares that "the powers not delegated to the United States by the Constitution, nor prohibited to it by the States, are reserved to the States respectively or to the people." The states may even decide upon their own laws and mode of government, provided only that it be republican. Within recent years almost every state has made some amendment to its own form of government. Upon the whole, in this process the state governors have gained, the state legislatures lost, power.

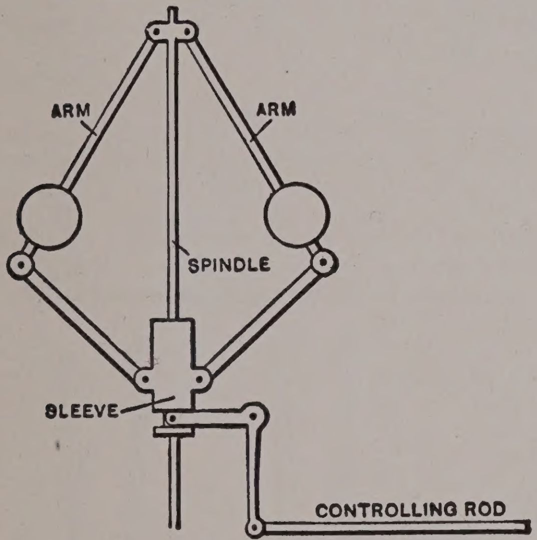
County government is created by the will of the legislature. In the United States there are nearly 7,000 counties, which are for the most part electoral districts. Each county has its court and often its asylum and its prison. Counties generally include several towns; but New York City reverses this system, and includes four counties.

Township government is most characteristic of New England, where it has grown up as a local institution from the time of the earliest settlements. In New England, then, the township practically takes the place of the county as the local unit. Indeed, in Illinois, Michigan, Minnesota, Wisconsin and other states the township system has been attempted, in imitation of New England, but with no very great success. A New England township votes money yearly for the poor, the schools, the township officers, the roads, bridges and other local needs which in most states fall wholly or in part to the care of the county.

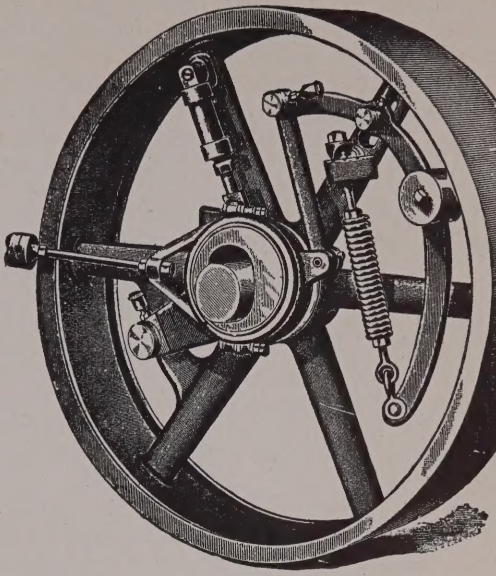
City government is, like the government of counties, dependent upon the will of the state legislature. Many cities hold their own individual charters by special enactment of the state legislature. Others govern themselves according to state enactments of a more general character, covering all cities of a given class. Sometimes the legislature provides that the charters are to be subject to the approval of a vote of the people. Because of the great wealth of the cities, there is apt to be more danger of corruption in city government than in other forms; but there is no doubt that nothing save a special municipal government is fitted to cope with the great and peculiar problems of city life.

School districts are divisions of the township, which were greatly in vogue in New England between 1800 and 1850. Indeed, the school district, in which the governing body is simply the assembly of householders or parents, is still the unit of school govern ment in some states. Thus about half of the towns of Connecticut preserve a district system. The district government of the schools has the advantage of an extreme democracy; but the disadvantages of smallness and isolation. In Connecticut since 1866 the school districts may be consolidated by a vote of the town. It was part of the work of Horace Mann to show the deficiencies and weakness of the district system which arise from its extreme decentralization.

Gov'ernor (engine), a device attached to a steam-engine or other motor for keeping the speed of the machine constant within practical limits. As applied to a steam-engine, the object of the governor is to act on the throttle-valve or on the supply of steam to the cylinder, so that the supply of steam is proportional to the load. The common engine-governors depend on balancing the centrifugal force of a revolving mass either against gravity or against the force of a spring. The governor applied to the steam-engine by Watt consists of two heavy balls attached to two inclined arms, which are jointed to an upright spindle so that the balls can move in a vertical plane, thus forming a double conical pendulum. The spindle is geared so as to revolve with a speed proportional to that of the engine, and as the speed of the spindle increases the balls fly out and rise against gravity. For a definite speed the balls have a definite position. Beyond this speed they rise, and below this speed they fall. By suitable links and levers the supply of steam is increased or decreased for lower or higher speeds. In modern high speed engines (speeds over 150) the governor most commonly used is placed inside the fly-wheel. A heavy mass on a lever attached to a spoke of the fly-wheel is held toward the center by a spring, and as the speed increases the spring is stretched and the mass flies out. By suitable mechanism this movement regulates the supply of steam. The demand upon a governor is that, in engines for ordinary service, the speed must not vary more than 2%; and for electric light service not over 1%.



WATT'S ENGINE-GOVERNOR



A HIGH SPEED ENGINE-GOVERNOR

Gow'an, Hon. James Robert, a senator of the Dominion, was born in Ireland in 1815 and came to Canada in 1832. After serving as a volunteer in the rebellion of 1837 he was called to the bar of Upper Canada in 1838, and appointed judge in 1843, retiring from the bench in 1883. He was appointed chairman of the board of judges in 1884 and a senator the year following. He introduced the present mode of procedure in divorce cases in the senate, and has been president of its divorce tribunal since 1889, making now 56 years of judicial service. In addition he has taken an important part in the revision and codification of the laws of the Dominion.

Grac'chi (*grăk'ī*), **The,** two Roman brothers, who were celebrated as soldiers and tribunes.

Tiberius Sempronius Gracchus, the elder, was born about 168 B. C., and in 137 served as questor with Mancinus against Spain. In 133 he was elected tribune and attempted to re-enforce the agrarian or land law of Licinius Stolo, and succeeded in passing the measure. But, as with all good men, he was falsely accused of violating the sacredness of his office; and, in the midst of the next election, he was, with many of his supporters, foully murdered.

Caius Sempronius Gracchus, younger by nine years than his brother, was serving in Spain under Scipio Africanus at the time of Tiberius' murder, but felt himself urged by his brother's death to return and take up his work. In 123 he stood for the tribuneship and was a second time elected in the following year. He labored always for the poor, and one of his first acts was to re-establish the agrarian law. But jealousy and deceit were at work, and he was defeated for a third term. Soon the senate began to repeal his laws; he appeared to protest, when a riot occurred wherein over 3,000 of his friends were killed. He was compelled to fly, and escaped to the grove of the Furies with a single slave, where the slave first killed his master and then himself. It was Cornelia, the mother of the Gracchi, who, in answer to a many-jeweled Roman matron's request to see some of her jewels, said, as she presented her sons: "These are my jewels!"

Gra'ces, The (Greek *Charites*), the daughters of Zeus and Eurynome, the embodiments of gracefulness and beauty. In Roman mythology they were the three daughters of Venus, by Jupiter or Bacchus, named Aglaia, Thalia and Euphrosyne. Though represented as three sisters, they are always inseparable, and in Greece annual festivals, called *Charitesia*, were held in their honor. In art they used to be represented as draped, but afterward appeared as nude figures in the bloom of early youth.

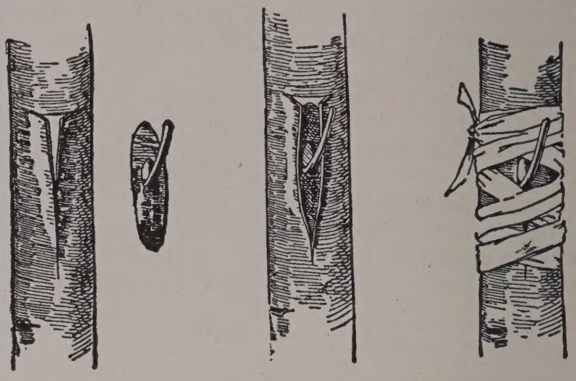
Grack'le. See Blackbird.

Gra'dy, Henry Woodfin, an eloquent southern orator, editor of the Atlanta (Ga.) *Constitution*, was born at Athens, Ga., in 1851, and died at Atlanta, Dec. 23, 1889. He was educated at the University of Georgia and at the University of Virginia, and devoted himself to journalism. His addresses made him widely known, as they were characterized by an impassioned patriotism which explains his popularity in the south. His two best-known addresses dealt with *The New South* and *The Future of the Negro;* the former was delivered before the New England Society. A biography of him was written by Joel Chandler Harris.

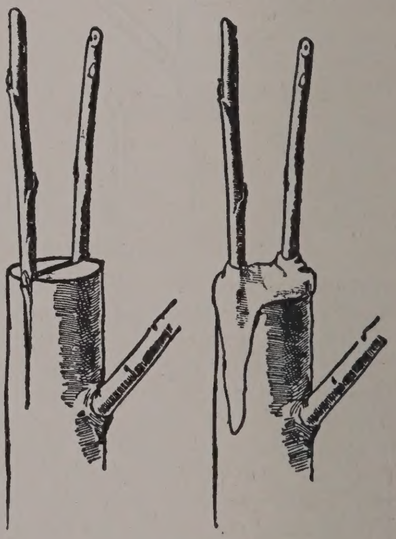
HENRY W. GRADY

Graft'ing, a process of plant-propagation in which a bud-bearing portion of a desirable variety is made to grow on another plant, so as to take advantage of the more or less well-established root-system of the latter. Graftings can be made only on plants of the same or very similar species, such as apple-quince or plum-peach combinations. The fruit of the part engrafted is like that of the tree it came from rather than like that of the stock. Different methods are budding, stem and root-grafting.

Budding is a method in which a mature bud of a desirable variety is grafted on another plant by slipping it through a cut in the bark of the stock preferably a young seedling. Budding is used when the plant is so valuable that every available bud is used for a separate plant; stem-grafting, when a tree proves a disappointment on coming into bearing; root-grafting is the usual process used by nurserymen. In stem-grafting, also called cleft-grafting, from the method, branches about one inch thick are cut off squarely and split; into this cleft two twigs are fastened so as to be in contact with the growing tissue next the bark, and the whole stump is waxed over. Not more than one fourth of a tree should be so treated in one year, and then just before the buds open. In grapes the process is modified by cutting off the stem near the ground. In root-grafting, the stock is a yearling seedling, not much larger than the scion, as the twig is called. The seedling root may be cut into several pieces, each a few inches long. Both scion and stock are cut off diagonally and split, joined and bound firmly together. This is done in the fall, after which the graft is allowed to heal together in moist sand through the winter, and is set out in the spring. Fruit trees must be propagated in this way because their seeds do not breed "true," as do grains, but tend to revert to the wild



BUDDING



GRAFTING

type, so that one cannot predict what a seedling will produce. See Plant-Breeding and Propagation. See Thomas: *The American Fruit Culturist* and Goff: *Principles of Plant Culture.*

Grail or **Graal, The Holy,** the subject of romance in the middle ages. It is the name given to the cup used by Christ in the Last Supper, in which, according to tradition, he changed the wine into his blood. This cup, kept by Joseph of Arimathea, was used to receive the blood which flowed from the wounded side of Christ as he hung on the cross. This account is found in the gospel of Nicodemus, which is not accepted as one of the books of the New Testament. Traces of the tradition are found in the struggles between Moors and Christians in Spain and in the founding of the order of Templars in Palestine. It is best known as one of the legends that cluster around the story of King Arthur and his knights. As the story relates, Joseph of Arimathea had been kept in prison by the Jews for fifty years after the death of Christ, but had been miraculously preserved from old age and death by the possession of the Holy Grail. He was released by Christ, who, teaching him the words used in the ceremony of the mass, commanded him to observe daily the sacrament of the Last Supper. Joseph came to Britain, and his son became the first bishop of the island. The last possessor of the Holy Grail sinned, and the cup was lost. The Quest of the Holy Grail was the search for this lost treasure undertaken by Arthur and the Knights of the Round Table. As it had been lost through the impurity of its possessor, so it could be found only by one who was perfectly pure. Launcelot, who had reached the room where it was kept, was warned to depart, but, disobediently looking in, was thrown to the ground by a blast of fire, where he lay “twenty-four days and as many nights as a dead man” Sir Galahad (according to some Sir Perceval) alone of the knights was pure enough to see the Holy Grail, which was soon after taken up to heaven. Several churches in France and Italy claimed the possession of this cup, and the Crusaders found one which was thought for a time to be the true Holy Grail and is still kept in the Cathedral of Genoa. In literature the story has had a prominent part, and is the subject of one of Tennyson's beautiful *Idylls of the King* and of Wagner's opera of *Parseval.* See *Idylls of the King* by Tennyson; *Morte d' Arthur* by Malory; and *History of the Holy Grail* by Furnival.

Grain-Eleva'tor, a building erected primarily for the purpose of storing grain, preparatory to its shipment in large quantities. A grain elevator is often situated at some port. It usually consists of large bins in which grain may be held, and a structure at the top called a cupola containing machinery for loading and unloading the grain. Machinery for cleaning the grain often occupies the lowest of three stories.

The unloading is commonly done by means of large shovels operated by machinery connecting with some sort of carrier to hoist the grain to a huge hopper high up in the building, whence it can be emptied by means of spouts into any desired place below, such as storage bin, weighing hopper, cleaning hopper or exit spout for reloading.

Throughout some parts of the country, as for instance in the wheat-growing district of the northwest, there are quite large elevators erected at railway stations for the purpose of providing farmers with good facilities for shipping their grain. In older and more thickly settled agricultural communities, with better railway facilities, smaller elevators usually suffice.

Grain elevators used to be constructed largely of wood, but the great loss resulting from the destruction by fire of elevators filled with grain has led to the practice of putting up fireproof structures wherever practicable. The most modern elevators usually have steel bins or concrete ones with steel framework, outside walls of brick or stone and a cupola of steel framing covered with iron.

Some of the largest grain elevators in America are at Chicago and at different ports on Lake Superior and others of the Great Lakes.

Gram'mar. Grammar, or the science of language, has always had an important place in the schools. Three hundred years ago and for a long time after, grammar, especially Latin grammar, held the first place in the schools. But with the growth of the common-school system grammar dropped into the background. Even in the grades of the common-school grammar holds a less important place than formerly. More thoughtful teachers omit grammar almost entirely in the first six grades, leaving it to the last year or two of the grammar-school.

The chief reasons why the study of English grammar has lost its former importance may be stated as follows: 1. English grammar is admittedly unsystematic and irregular, with few inflections and an abundance of peculiar idioms and exceptions to rules. It does not serve, therefore, the supposed purpose of discipline, such as was formerly believed to be the special merit of Latin and Greek grammar. 2. It has been discovered that the study of grammar does not produce such important effects in leading to correct usage in common speech as was formerly supposed. It has been observed that children go on using incorrect English in spite of their study of grammar. 3. English grammar and the methods of teaching it were based upon the old methods and ideas applied to Latin and Greek. But these studies have now been almost wholly dropped out of the elementary schools. 4. The science of grammar is formal and abstract, and by many is supposed to be difficult for children, at least until they reach the seventh or eighth grades. Some, however, would claim that this is the special reason why it should be taught, because it introduces pupils to a more abstract form of thinking than other studies.

The general tendency of modern education is to make all studies more concrete and realistic; and, in agreement with this notion, geography, nature-study, stories and literature, history and manual training have gained a more important place in schools, while grammar has lost.

The real value of grammar may be stated thus: All human thought is expressed chiefly through language and, at bottom, the rules of correct thinking are involved in the study of grammar. Correct language is the popular form of logical thinking. To analyze sentences, to examine the structure and arrangement of the parts, to study the various modes of expressing thought and shades of thought grammatically — these activities have always been regarded as the most fundamental and universal method of disciplining the intellectual faculties. In this respect grammar contributes an element of logical accuracy to all studies and lays a basis for correct thinking. The study of grammar (in spite of the criticism mentioned above) also teaches correct usage. Students of more mature years are greatly helped in correcting their faults by insight into the rules of grammar. They learn to criticize themselves and the wrong usages to which they have been accustomed.

The method of teaching grammar has been a subject of much controversy among educators. The older grammars were essentially deductive, proceeding from rules and principles to examples and further applications. Some of the later grammars have emphasized the inductive approach to the rules of grammar. In the inductive method the analysis of sentences is put first. Out of this study of sentences develop later the rules of syntax and the classifications of forms of speech and usages. Some of the more recent grammars have taught the subject as a thought-study, an analysis of the processes of thinking rather than a formal treatment of words and sentences.

Students in the high-school, employed in the study of German or French (or it may be Latin or Greek), are believed to receive a grammatical training superior to that given by the study of English. A chief argument for the study of Latin is first its linguistic disciplinary training and second its reflex influence upon English grammar and speech. Latin has had a great historical influence in determining the development of English speech. It has supplied many words and phrases and has shaped English speech through great writers who were fully saturated with the Latin language and Latin style. See Chubb's *The Teaching of English;* Hinsdale's *The Teaching of the Language Arts;* Whitney's *Grammar;* and Carpenter's *The Teaching of English* (Baker and Scott).

C. A. McMurry.

A Short Course in the Most Common Errors of Word-Usage, Pronunciation and Spelling

A GLANCE AT THESE WORDS MAY SAVE YOU MANY A BLUSH

These words are frequently mispronounced. The list is carefully selected, and you may be surprised that you have pronounced some of them wrong all your life. As a rule, the errors lie in misplaced emphases on syllables, though in some cases other causes are responsible. Place the stresses on italicized syllables.

ab ject
ac *cli* mate
ad *dress*
a ero *plane*
ag gran dize
ā lias
al *loy*
al *ly*
am a *teur*
ap pa *ra* tus
ap pli cable
au to mo *bile*
bĕs tial
cal *li* o pe
cas ual ty
ca *thol* i cism
cav alry
cer e bral
char ac ter
clan *des* tine
clem atis
cog *no* men
com ba tant
com par able
con *do* lence
con *ju* gal
deaf (dĕf)
coupon (ku pon)
de *co* rum
def i cit
des *sert*
des ul tory
dis *course*
dis locate
dis *rep* u table
docile (*dŏs* il)
ec zema
en *tire*
e *pit* o me
ex *po* nent
ex *press*
ex qui site
ex *tol*
fiance′ (fē ăn sā)
fi *nance*
for mid able
gri *mace*
har ass
hos pi table
host age
im pious
im potent
in choate
in *com* par able
in fam ous
in fluence
in *qui* ry
in ter est
ir re *me* di able
ir *rep* ar able
lab or a tory
lēisure
mis chiev ous
mus *tache*
par ti ciple
per gola
per spi ra tion
pre *ce* dence
prec e dent
re *cess*
re *source*
ro *bust*
ro *mance*
sac ri fice
sergeant (*sàr* gent)
suite (swēt)
te di ous
tem per a ment
va *gary*
ve he ment ly
vis count (vī count)

COMBINATIONS WHICH CUSTOM HAS ESTABLISHED FOR US

A careful speaker or writer will use the indicated prepositions with the words listed below. The combinations are idiomatic; that is, they have been established by custom, and should no more be violated than good manners. Correct usage will assist your development in every way.

agree *to* (a proposition)
agree *with* (a person)
agreeable *to* (not *with*)
angry *at* (a condition)
angry *with* (a person)
attend *to* (something)
attend *upon* (a person)
careful *about* (a situation)
careful *of* (your money)
compare *with* (for contrast)
compare *to* (for resemblance)
comply *with* (not *to*)
convenient *for* (use)
convenient *to* (a person)
correspond *to* (an object)
correspond *with* (a person)
deal *in* (things)
deal *with* (a person)
differ *from* (other objects)
differ *with* (a person)
different *from* (not *than*)
dissent *from*
enamored *of* (not *with*)
entrust *to* (a person)
exception *to* (not *at* or *with*)
free *from* (not *of*)
independent *of* (not *from*)
inferior *to*
in search *of* (not *for*)
insist *upon*
listen *to* (not *at*)
mindful *of* (not *for*)
part *from* (a person)
part *with* (a thing)
pleased *with* (not *at*)
possessed *of* ability (not *with*)
prejudice *against*
prevail *upon* or *over*
reconcile *to* (a person)
reconcile *with* (a condition)
resemblance *to*
resolve *on*
the Reverend Mr. — (not Rev. —)
try *to* do a thing (not try *and* do a thing)
wait *for* (an occurrence)
wait *upon* (a person)

THREE HUNDRED NINETY-THREE DEMONS OF OUR LANGUAGE

Spelling will not be very difficult for one who carefully studies the more difficult words. Our English language contains about half a million words—four times as many as the nearest numerical competitor, the German. Of course, every person uses only a few thousand words. Shakespeare, who used more than any other writer of English, used 15,000.

The carefully selected list which follows contains the common words frequently misspelled. In whatever walk of life you may pursue, spelling is important, for this is the age of the written word. This list will be of the greatest value to the young person, because it contains the common words often misspelled. In studying this list, remember to study the "misused or confused" list also given.

ache
absence
absorption
acceptable
accessible
accidentally
accommodate
accumulate
accustom
acknowledgment
acquainted
acquitted
across
addressed
adviser
aeroplane
again
allotted
all right
altogether
always
among
analysis
analyze*
angel
angle
annual
answer
anxiety
anxious
any
apparatus
appearance
arctic
argument
arise
arrangement
arrival
ascend
athletic
audience
auxiliary
awkward
baring
  (making bare)
barring
  (prohibiting)
based
becoming
beggar
beginning
believing
benefited
biscuit
blue
  (color)
blew
boundary
brake
  (stop by friction)
break
Britain
built
buoyant
bureau
business
busy
buy
calendar
candidate
can't
cemetery
  (graveyard)
(seminary, or school)
changeable
changing
characteristic
chauffeur
column
coming
comma
commission
committee
comparative
comparison
compel (lled)
competent
concede
conceivable
conferred
conqueror
conscience
conscientious
considered
control (lled)
co-operate
cough
country
courteous
courtesy
cylinder
dear
deer
  (animal)
deceitful
decide
decision
deferred
definite
deceased
descend
describe
despair
desperate
develop
development
dictionary
difference
dilemma
dining room
dinning
  (noise)
disappear
disappoint
disease
dissatisfied
dissipate
divide
divine
doctor
does
done
don't
drudgery
dying
early
easy
ecstasy
eighth
eliminate
embarrass
encouraging
endorsed
enough
equipped
especially
etc.
every
exaggerate
excellent
except
exhaust
exhilarate
existence
expense
experience
explanation
familiar
fascinate
February

THREE HUNDRED NINETY-THREE DEMONS OF OUR LANGUAGE — *Continued*

fiery
finally
financier
forbear
fraternity
friend
fulfil (or ll)
gaiety*
gallant
gases
gauge
generally
gild*
gipsy*
goodby*
government
governor
grammar
gray
grievous
guard
guess
half
harass
haul
  (pull)
having
hear
  (sound)
here
height
hesitancy
hindrance
hoarse
  (harsh)
hoping
  (hope)
hopping
  (hop)
hour
huge
humorous
hundredths
hurriedly
imaginary
imitative
immediately
incidentally
incredulous
independent
indispensable
influence
infinite
inquire
instead
intellectual
intelligence
intentionally
intercede
invitation
irresistible
itself
judgment
knew
  (recognized)
know
knowledge
laboratory
ladies
laid
leisure
library
license
lonely
losing
lying
maintain
maintenance
making
many
marriage
mathematics
meant
medieval*
miniature
minute
mischievous
misspell
mistake
mold*
much
murmur
muscle
necessary
negroes
neither
nickel
nineteenth
ninetieth
ninety
ninth
none
noticeable
nowadays
oblige
occasionally
occur
occurrence
o'clock
offered
often
omission
omitted
once
operate
opinion
opportunity
optimistic
outrageous
paid
parallel
parliament
partner
pastime
peaceable
perceive
perform
permissible
perseverance
personal
personnel
  (body of persons)
perspiration
persuade
pervade
picnic
picnicking
planned
pleasant
politician
possess
possible
prairie
precede
preference
preferred
preparation
privilege
probably
proceed
profession
proffer
program*
promissory
pronounce
pronunciation
prove
purchase
pursue
quantity
ready
really
receive
recognize
recommend
reference
referred
regard
religion
religious
repetition
representative
resistance
restaurant
rhythm
ridiculous
safety
sandwich
says
schedule
science
seams
  (in cloth)
seems
  (appears)
seize
separate
sew
  (with needle)
sow
  (plant)
several
shining
shoes
shriek
siege
since
skilful*
sophomore
statement
stopping
straight
stretch
succeed
successful
sugar
superintendent
supersede
sure
surprise
symmetrical
tear
  (rip)
temperament
therefore
though
thorough
through
till
tired
to-morrow
to-night
too (also)
together
transferred
traveler*
treacherous
treasurer
tries
trouble
truly
Tuesday
tyranny
until
used
using
usually
vengeance
very
vigilance
village
villain
volume
wear
Wednesday
weird
welfare
where
which
wintry
women
would
writing
written
wrote

* preferred

A FEW HANDY RULES WHICH WILL SAVE YOU TIME

1. *I* before *e* (relieve)
Except after *c* (deceive, receive)
Or when sounded as *a*
As in *neighbor* and *weigh.*

Exceptions: Neither foreign financier seized either counterfeit forfeit. Either species of weird leisure leads to unhappiness.

2. The *s* of the *dis* prefix is *not* doubled. Of course, the word to which the prefix is added sometimes begins with an *s*. This *s* is retained, and gives the appearance of doubling. Examples: *appear, disappear; satisfied, dissatisfied.*

3. *Proceed, succeed, exceed* are the double *e* words. The others are *ede*, as *precede, concede,* etc. One word, *supersede*, uses *s* instead of *c*.

4. In many words *c* distinguishes the nouns; *s* distinguishes the verb. Examples: *advice, advise; practice, practise.*

5. Words ending in *y* preceded by a consonant, form their plural by changing *y* to *i* and adding *es*. Examples: *duty, duties; study, studies.* When the *y* is preceded by a vowel, retain the *y*. Examples: *journey, journeys; valley, valleys.*

6. Words ending in silent *e* generally drop the *e* before suffix beginning with a vowel. Examples: *force, forcible; change, changing.* But after *c* or *g*, and before a suffix beginning with *a* or *o*, the silent *e* is retained. Examples: *peaceable, changeable, outrageous.*

DO YOU MISUSE OR CONFUSE SOME OF THESE COMMON WORDS?

How many of the words in this list do you misuse? A great many persons do not use all of them correctly. This is a very carefully selected list, and contains the principal errors of diction, or use of words. You will probably find that you will be greatly benefited by noting the correct uses given. When you can use these words correctly, you have mastered many errors which are made thoughtlessly by some educated, and unknowingly by uneducated persons. Many of these words are frequently misspelled; so note the spelling closely also.

Accept, except. *Accept* means *to receive; except, to reject.*

Advice, advise. *Advice* is a noun, *advise* a verb. He *advised* him; and the *advice* was well taken.

Affect, effect. *Affect* means *to influence somewhat. Effect* means *to work a complete change.* As a noun, *effect* means *result.* The water *affected* my ears. The lawyer *effected* the release of the prisoner.

Affectation, affection. *Affectation* means *pretence; affection* means *love.*

Aggravate. This word means *to make worse.* It is wrongly used in the sense of *annoy.* Wrong: His teasing *aggravated* me. Right: The disease was *aggravated* by improper treatment.

Ain't. Improper always. *Isn't* means *is not; aren't* means *are not.* There is no proper contraction for *am not.*

Altar, alter. *Altar* is a certain piece of church furniture. *Alter* means *change.*

A lot of. It is better to say *many*, or *much.* Many men. Much work. Do not use *a lot of.*

Aloud. Much better than *out loud.*

Allusion, illusion. *Allusion* means a *reference to; illusion* means a *false vision.* He *alluded* to the *illusion.*

Ally, alley. *Ally* is a *companion. Alley* is a *narrow street.*

Already, all ready. *Already* means *at present*, or *at a past time. All ready* means *completely ready. Already* the band had passed the corner. The band was *all ready* to play.

Alright. There is no such word. Use *all right.*

Amount, number. *Amount* means *mass* as a whole. *Number* refers to individuals. The *amount* of traffic is appalling. The *number* of vehicles is very large.

And etc. Wrong. *Etc.* is the abbreviation for the Latin words *et cetera, et* meaning *and*, and *cetera so forth.* Thus *etc.* in itself means *and so forth.*

Anecdote, antidote. *Anecdote* means a *short story* or *incident.* An *antidote* is something which will *counteract a poison.*

Anxious. This word does not mean *eager. Anxious* carries the idea of *serious concern.* I am *eager* to go. I am *anxious* concerning his safety.

Anybody else's, anybody's else. Both correct. First preferred.

As—as. So—as. Use the first when no negative is expressed. I am *as* tired *as* he is. Use the second with the negative. I am *not so* tired *as* he is.

Auto. This abbreviation is not in good form.

A ways. Incorrect, since *a* is singular and *ways* plural. Say, I am *a* long *way* from home.

Awful, terrible. *Awful* means *filled with awe.* It does not mean *terrible.* Do not use *awful* to express *extremely.* I am *extremely* worried. It was an *awful* sight (meaning that the sight filled one with awe, or the hushed wonder).

Balance. It is better not to use *balance* in the sense of *rest* or *remainder.* Use it to suggest *equality* or *equilibrium.* Right: The *remainder* of the day. Poor: The *balance* of the day. Good: The *balance* of power among the nations was maintained.

Because. Do not use *because* for *the fact that.* Wrong: *Because* he is going is no reason I should go. Right: *The fact that* he is going is no reason I should go. Right: I am going *because* he is going.

Beg. Use when you wish to express honest regret, or solicitation. Do not use in the trite expression, *I beg to remain, yours truly.*

Begin, start, commence. Distinguish among these words carefully. Correct uses are here given. I *started* to school. I *began* practising for the hurdles. The program *commences* at eight o'clock.

Beside, besides. *Beside* means *at the side of. Besides* means *moreover. Besides*, the dog was *beside* me.

Better, best. More, most, etc. The comparatives, *better, more* are used when comparing *two* objects. *Best* and *most* are superlatives, and are used when *three* or more objects are under consideration. John is a *better* student than I. John is the *best* student in the class. *More* persons live in New York than in Chicago. *Most* of the cotton produced on earth is grown in the Southern States.

Between, among. *Between* requires *two* objects only. *Among* requires *three* or more. Between New York and *San Francisco.* Among the various cities. *Between*, since it is a preposition, takes the objective case. *Between him* and *me.* Wrong: *between he* and *I.*

Blame it on. This is a poor expression. Faulty: He *blamed it on* me. Right: He *blamed me* for it.

Bridal, bridle. *Bridal* refers to a *bride. Bridle* is a *part of a harness.*

Broadcasted. Both the past and the past perfect forms of the word are the same: broadcast. So *broadcasted* is not necessary at all. He *broadcast* the message. He *had broadcast* the message. The message was *broadcast.* Poor: He had *broadcasted* the message. Poor: The message was *broadcasted.*

Burst. Like *broadcast, burst* is the past and past participle form. There is no word *bursted.* Neither is *bust* in good form. Right: The boiler *burst.* Wrong: The boiler *busted* (*bursted*).

But what. As a rule, you should use *but that.* Wrong: I do not know *but what* he is here. Right: I do not know *but that* he is here. *But what* is correct if you can substitute *but that which.* Right: I can do nothing *but what* (*that which*) is right.

Can, may. *Can* denotes *ability. May* denotes permission. *I can go* means that you are physically able to go. *I may go* means that you have permission to go.

Cannon, canon, canyon, cañon. *Cannon* is a gun. *Canon* is a church official. *Canyon* is a deep cut in a mountain made by a stream. Cañon is a foreign form of canyon, and is sometimes used in southwestern United States, where the Spanish language once gained a foot-hold.

Capital, capitol. *Capital* denotes a sum of money, a chief thing of its kind; and is used to designate the seat of government. *Capitol* refers to the chief governmental buildings. Washington, the capital of the United States, contains the capitol (building).

Cannot help but. This expression is wrong. It is a mixture of two correct phrases. Right: I *cannot but go.* Right: I *cannot help going.* Wrong: I *cannot help but* go.

Can't hardly. Wrong. *Can't* means *can not. Hardly* means *with difficulty.* Right: I *can hardly* go. Right: I *can't* go. Wrong: I *can't hardly* go.

Canvas, canvass. *Canvas* is a cloth. *Canvass* means *to solicit.*

Cite, sight, site. *Cite* means *to offer as an example or evidence. Sight* means *view;* it also is one of the five senses. *Site* means *a specific location.* He *cited* the case of Jones vs. Jones. It was a pretty *sight* (view). His *sight* was impaired. I shall build my house on this *site.*

Claim, maintain. These words do not convey the same idea. *Claim* means *to assert a right over what is one's own. Maintain* means merely *to assert.* He *claimed* his book. He *maintained* that he was right in his assertion.

Cloths, clothes. *Cloths* is the plural of *cloth. Clothes* means *garments.* He showed me several *cloths* (kinds of cloth). Put on your *clothes.*

Complected. This word is not in good standing. Say *complectioned* instead.

Conscience, conscious. *Conscience* refers to one's *moral sense. Conscious* means one is *aware* of a condition or fact.

Could of. Wrong. Say *could have.*

Couple. This word means a *pair*. Do not use it when you mean two—but not a pair. Right: *Two* hours. Poor: A *couple* of hours.

Course, coarse. *Course* means a *path* or *route*. *Coarse* means *rough, uncouth, not fine*.

Credible, creditable. *Credible* means *believable*. *Creditable* of worth or merit. The feat is hardly *credible*. It was a most *creditable* action on his part.

Dairy, diary. A farmer with cows may operate a *dairy*. Personal daily events become one's *diary*, when written.

Data. This word is plural. The singular form is *datum*. Strictly speaking, one should say, *These data are correct*, and *This datum is correct*. However, *data* is so frequently used in the singular sense that it is becoming permissible to use the word as such.

Deadly, deathly. *Deadly* means *capable of producing death*. *Deathly* means *death-like*.

Demean. This word does *not* mean *to lower* oneself; it means merely to *conduct*.

Desert, dessert. *Dessert* is a part of a dinner. *Desert* is an arid region.

Disregardless, irregardless, regardless. *Disregardless* and *irre-* are both improper forms of *regardless*. The *less* means *not*, so it is unnecessary to use the *dis* or the *ir*, both of which mean *not*. Say *regardless*. Remember the other two forms are not acceptable.

Dissent, descent. *Dissent* means *to disagree*. *Descent* means *a downward path or movement*.

Don't, doesn't. *Don't* is a contraction of *do not*. It is not to be used for *doesn't*, which means *does not*. Wrong: He *don't* know about it. Right: He doesn't know about it. Right: They *don't* know about it.

Dove. There is no such word. The proper form for the past tense of *dive* is *dived*.

Dual, duel. *Dual* means *two*. *Duel* means a *fight between two persons*.

Due to. It is incorrect to use *due to* in the sense of *on account of*, or *because of*. Wrong: *Due to* illness, John was not able to come to school. Right: John's absence from school *was due to* illness. In general, remember that *due to* should be used when *is, was*, or some other form of the verb *be* precedes the phrase.

Emigrate, Immigrate. *Emigrate* means *to leave a country*. *Immigrate* means *to enter a country*.

Enthuse. This word is not in good taste.

Expect. Use when you mean *look forward to*. Do not use in the sense of *suppose*. Poor: I *expect* he will come. Right: I *suppose* he will come. Right: I *expect* him to-day.

Farther, further. *Farther* expresses *distance*. *Further* means *in addition to*. Wrong: I am going *further* than you are. Right: I am going *farther* than you are. Right: He said he would give the matter *further* thought.

Fewer, less. Each of these words is frequently misused for the other. *Fewer* refers to *units*. *Less* refers to *mass*. Wrong: I have *less* eggs than you. Right: I have *fewer* eggs than you. Right: He has *less* butter than I.

Fine. Used to express too many ideas. *Fine* means *delicate*. Poor: I had a *fine* time. Right: That is a *fine* piece of cloth.

First, firstly. *First* is an adjective and a noun. *Firstly* is an adverb. *Firstly* is now seldom used, *first* being the more common. Right: The *first* man. Right: *First, secondly, thirdly*. Right, but not frequently used: *Firstly, secondly*, etc.

Formally, formerly. *Formally* means *in a formal way*. *Formerly* means *previously*. Right: He was *formerly* cashier of the bank. Right: She spoke *formally* (in a formal way). Right: When she spoke *formerly* about this matter (on a previous occasion).

Forth, fourth. *Forth* he went. The *fourth* number.

From hence, from thence. *Hence* means *here*. *Thence* means *there*.

Funny. This word means *laughable*. It does not mean *queer*.

Gent. Crude abbreviation for *gentleman*.

Good, well. *Good* is an adjective. *Well* is an adverb. Wrong: He did *good* in his work. Right: He did *well* in his work. He did his work *well*. Right: He did *good* work.

Gotten. This form is seldom used. The more proper form is *got*. Say *got* instead of *gotten*.

Guess. *Guess* means *to hazard a conclusion without thinking*. It does not mean *think*. Wrong: I guess I shall go. Right: I *suppose* I shall go. Right: I'll guess 'yes'.

Had ought. Wrong: Say *ought* instead. Wrong: He *had ought to go*. Right: He *ought* to go.

Hanged, hung. Both are past tenses. But *hanged* refers *only* to killing. *Hung* means *to have suspended*. Wrong: They *hung* (killed) the man. Right: They hung the clothes on the line. Right: They *hanged* (killed) the man.

Healthy, healthful. *Healthy* means *possessing health*. *Healthful* means capable of *giving health*. Wrong: The boy is *healthful*. Right: The boy is *healthy*. Right: Fruits are *healthful*.

Human, humans. Human is an adjective, not a noun. *Humans* should never be used. Wrong: He is a *human* (noun). Wrong: *Humans* (noun) walk on two legs. Right: He is human (adjective). Right: It is a *human* (adjective) characteristic. Substitute *human being* for *human* and *human beings* for *humans*, when used as nouns. Right: A *human being*. *Human beings* walk on two legs. *Humane* means *just and kind*.

Hygienic, sanitary. These do not mean the same thing. *Hygienic* refers to individual health; personal habits. *Sanitary* refers to general conditions (streets, sewers, etc.) which pertain to health of a group.

Holy, holly, wholly. *Holy* means *sacred*. *Holly* is a vine with red berries. *Wholly* means *completely*.

Imminent, eminent. *Imminent* means *great and immediate*. *Eminent* means *famous, high in esteem*. He was in *imminent* danger. It is *imminently* important. Lincoln was an *eminent* man.

Instance, instants. *Instance* means *example*. *Instants* means *short periods of time*. Right: This *instance* will serve as an example. Right: Several *instants* passes.

Its, it's. *Its* is possessive in itself. *It's* means *it is*. Right: *It's* very cold outside. Right: *Its* ears are frozen.

Kind of a, sort of a. Wrong. Omit the *a*. Wrong: I like this *kind of a dress*. Right: I like this *kind of* dress. Right: I like this *sort of* dress. Do not use *kind* for *rather*. Wrong: He felt *kind of* tired. Right: He felt *rather* tired.

Later, latter. *Later* means *more late*. *Latter* means *second in a series of two*.

Lead, led. *Lead* is present tense; *led* past tense.

Learn, teach. *Learn* means *to receive knowledge*. Teach means *to convey knowledge*. Wrong: He can not *learn* me anything. Right: He can not *teach* me anything. Right: I can *learn* a great deal.

Leave, let. Leave means *to release*. Let means *to permit*. Wrong: *Leave* me do it. Wrong: *Leave* me go. Right: *Let* me do it. Right: *Let* me go. Right: I shall *leave* the house.

Lessen, lesson. *Lessen* means *to diminish*. *Lesson* is an assignment given by your teacher for your benefit.

Liable, likely, apt. These words are not inter-changeable. *Liable* denotes responsibility. *Likely* means *probable*. *Apt* means *fitting, natural ability*. Wrong: He is *liable* to get hurt. Wrong: He is *apt* to get hurt. Right: He is *liable* to the law. Right: He is *likely* to get hurt. Right: He is an *apt* pupil. Right: It was an *apt* expression.

Lightning, lightening. The first word denotes electrical bolts from the sky. The second word means (a) *growing brighter*, (b) *becoming less heavy*.

Lie, lay. *Lay* is the past tense of *lie*. (Lie, lay, lain.) It is the present tense also of the transitive verb. (Lay, laid, laid.) This double use of the word leads to confusion. Remember that *lie, lay, lain* take no object. Remember that *lay, laid, laid* take an object.

Like. Misused for *as*. Wrong: Do *like* I do. Right: Do *as* I do. *Like* takes an object. Right: Do you *like* me? He sang *like* Caruso.

Loan, lend. *Loan* is a noun. *Lend* is a verb. Right: He received a *loan*. Poor: *Loan* me some money. Right: *Lend* me some money. *Loan* is used as a verb when large sums of money are involved, as among the nations of the world.

Lose, loose. *Lose* means *to suffer the loss of*. *Loose* means *free*, or to set free.

Lots of. Not in good repute. Say *many*, or *much*.

Majority, plurality. A *majority* is the number by which *one* candidate exceeds the votes of *all* his competitors. *Plurality* is the number of votes by which *one* candidate exceeds his nearest competitor. *A*, *B*, and *C* are running for office. *A* receives 6 votes, *B*, 3 votes, *C*, 1 vote. *A* has a *majority* of 1 over all his competitors. *A* has a plurality of 3 over his nearest competitor.

Marital, martial. *Marital* refers to *marriage*. *Martial* refers to *war*. The *marital* relation. The *martial* strains.

Might of. Wrong. Say *might have*. Right: He *might have* gone.

Most, almost. *Most* means the *greatest number* or *share.* *Almost* means nearly. Wrong: We are *most* there. Right: We are *almost* there. Right: *Most* of us are here. *Almost* is sometimes written '*most*, when one is quoting "baby talk."

Neither. The companion of this word is *nor.* Say *neither* . . . . *nor*, and *either* . . . . *or.*

Nice. Do not use in the sense of *lovely*, or *pleasant.* Poor: We had a nice *time.* *Nice* means *precise*, *delicate.* Right: He made a *nice* (precise) distinction.

Noted, notorious. *Noted* means *illustrious, favorably well known.* *Notorious* means *well known in a bad sense.* Washington was a *noted* man. The *notorious* criminal is at large.

O, oh. *O* is used with a noun in direct address. *Oh* is an exclamation. *O* (you) promise me. *O* Lord, I pray of Thee. *Oh*, I'm hurt.

Off of. Wrong. Omit the *of.* Wrong: He jumped *off of* the bridge. Right: He jumped *off* the bridge.

Ordnance, ordinance. *Ordnance* means *ammunition.* *Ordinance* is a *law.*

Ought to of. Wrong: He *ought to of* gone. Better: *He ought to have* gone. Right: He *should have* gone.

Over with. Crude. Omit the *with.* The War is over.

Party. In legal terminology, *party* is correctly used to designate a single person; as, *party of the first part.* However, in general use, *party* refers to a group of persons, and is not used to refer to an individual. Vulgar: I saw a *party* yesterday. Correct: I saw a *person* yesterday.

Past, passed. *Past* means time gone by. *Passed* is a verb. He *passed* me.

Philippines, Filipinos. The first word designates the islands; the second word, the native people of the islands. Note the spelling.

Planned, planed. He *planned* his day's work. He *planed* the board.

Piece, peace. *Piece* means part of a whole. *Peace* is the contrast of *war.* Let me see this *piece* of cloth. "Let us have *peace.*"—Grant.

Practical, practicable. *Practical* means *fit for doing*, opposed to *theoretical.* *Practicable* means *capable of being practised.* Right: It is a *practical* idea. The combination is *practicable.*

Precedents, precedence. *Precedents* are acts of the past used as authorities or models for to-day. *Precedence* is the act of going before someone else, or placing one thing before another in point of importance. Right: Common law is based on *precedents.* Right: Old *precedents* frequently take *precedence* (are considered more authoritative) over later customs.

Presence, presents. Right: His *presence* is requested. Right: She gave me some *presents.* Right: He *presents* a good appearance.

Principal, principle. *Principal* is an adjective meaning *chief.* Right: The *principal* rule to follow is, etc. The *principal* house on the street. *Principal* is also a noun meaning *money invested*, or an *official.* Right: The *principal* will bear interest. The *principal* of the school. *Principle* is always a noun. It is never an adjective. Wrong: The *principle* house on the street. Right: One should be governed by good *principles.*

Proof, evidence. *Evidence* is matter submitted to help establish a fact. *Proof* is matter which establishes the fact as a certainty. The *evidence* submitted furnishes *proof* of the fact.

Proven. Obsolete. Use *proved.* Right: It *was proved.*

Quiet, quite. *Quiet* means *still, peaceful, noiseless.* *Quite* means *entirely, wholly.* Right: It is a *quiet* night. Poor: He is not *quite* well. (*Quite* in the sense of *hardly* is not fully sanctioned.) Right: He is *hardly* well. Right: He is *quite* (absolutely, completely) well.

Rain, reign, rein. It is likely to *rain* to-day. A sovereign *reigns* over his people. The *reins* of the harness are broken.

Raise, rise, rear. (*Raise, raised, raised.*) (Rise, rose, risen.) (*Rear, rear, rear.*) *Raise* is transitive, that is, it *must* take an object. *Rise* is intransitive, that is, it *never* takes an object. Wrong: *Rise* the curtain. Right: *Raise* the curtain (*curtain* is the object.) Right: *Rise* up. Right: He *arose* this morning. Do *not* use *raise* in the sense of *rear.* *I was raised on a farm* is crude. Say, *I was reared on a farm.*

Rarely ever. Omit the *ever.* Say *rarely.* *Ever* is unnecessary.

Real. *Real* does not mean *very.* Wrong: I am *real* happy. Right: I am very happy.

Regards, regard. Say, *as regards.* Say, *in regard to.*

Respectfully, respectively. *Respectfully* means *courteously.* *Respectively* means *as relating to each.* Wrong: Yours *respectively.* Right: Yours *respectfully.* Right: John and George *respectively* (one after the other) will clean the room.

Remember of. Omit the *of.* Wrong. I *remember of* going. Right: I *remember* going.

Rite, right, write. *Rite* is a *ceremony.* Right: The *rites* were performed. Right: The *right* man is here. Right: He is in the *right.* Right: *Write* me a letter.

Same. Same is an adjective. Right: This is the *same* boy. *Same* is not used any more as a pronoun, except in legal terms. Wrong: John is a good boy, and I wish the *same* (John) success. Right: John is a good boy, and I *wish* him success. Right, in legal terms: The *same* (man) shall appear at eight o'clock.

Scarcely. Do not use *not* with *scarcely.* Wrong: I can *not scarcely* see. Right: I can *scarcely* see.

Second-handed. Leave off the *ed.* Say, *second-hand clothes.* Say, I purchased it *second-hand.*

Seldom ever. Wrong, insofar as *ever* is superfluous. Say *seldom*, and omit the *ever.* Right: I *seldom* go any more.

Set, sit. (*Sit, sat, sat.*) (*Set, set, set.*) *Sit* is intransitive, and never takes an object. *Set* is transitive, and always takes an object. Right: Let me *sit* down. I *sit* down. You *sat* down. You *have sat* down. Right: *Set* it (object) down. He *set* the book (object) on the table. He *has set* the book (object) on the table.

Shone, Shown. The sun *shines, shone.* He *shows* (*showed, has shown*) me the book.

Size, sized. *Size* is a noun. *Sized* is an adjective. Wrong: I wish to purchase a small *size* stove. Right: I wish to purchase a small *sized* stove. Right: His *size* (noun) is small.

So, such. Do not use these words as synonyms of *very.* Do not say, *He is such a good speaker.* Do not say, *He is so handsome.* Say, *He is a very good speaker.* Say, *He is very handsome.*

Somewheres. Crude. Say *somewhere.*

Speech, speak. A *speaker speaks* a *speech.*

Stationary, stationery. *Stationary* means *fixed, motionless.* *Stationery* is *writing paper and materials.*

Statue, statute, stature. A *statue* is a *carved image.* Right: The *statue* of George Washington is seen in Trenton, New Jersey. *Statute* is a law. This *statute* was passed in 1926. *Stature* means *height.*

Steal, steel. *Steal* means *to take what is not one's own.* *Steel* is a metal product of iron.

Sure. An adjective. Right: The elephant crossed the field with *sure* steps. Do not use *sure* as an adverb. Wrong: He *sure* can run. Right: He *surely* can run.

Suspicion. A noun. Do not use as a verb, in the place of *suspected.* Wrong: I *suspicioned* him. Right: I *suspected* him. Right: His actions placed him open to *suspicion.*

That there. Do not use. Omit *there.* Wrong: *That there* boy. Right: *That* boy.

Their, there, they're. *Their* is a possessive pronoun. Right: *Their* books are on the table. *There* is an adverb. Right: *There* it is. *There* once was a boy, etc. *They're* is a contraction of *they are.*

These kind, those kind, these sort, those sort. Wrong, because plural words are united with singular words. Right: *This kind, that kind, this sort, that sort.* Right: *These kinds, those kinds; these sorts, those sorts.*

This here. Wrong: *This here* book. Right: *This book.*

Till. Right: I will be here *till* you return. Do not use *till* in place of *when.* Wrong: I had scarcely reached the curb *till* an automobile sped by. Right: I had scarcely reached the curb *when* an automobile sped by.

Transpire. *Transpire* means *become known.* It does not mean *occur.* Wrong: A death *transpired* yesterday. Right: A death *occurred* yesterday. It *transpired* to-day (became known) that the bank was insolvent.

Track, tract. *Track* is a *road.* *Tract* is a plot of land. *Tract* is also a *treatise*, especially upon a religious subject.

Underhanded. Omit the *ed.* Right: It was an *underhand* act.

Up. Frequently used unnecessarily. Poor: He *settled up* his account. Better: He *settled* his account. He *ended* his tale.

Very. Wrong: He was *very pleased.* When using a past participle, such as pleased, use *much* with *very.* Right: He was *very much* pleased. He was *very much* fatigued.

Wandering, wondering. *Wandering* means *rambling.* *Wondering* means *act* of one who is *marveling* or *admiring.*

Ways. Frequently misused for *way.* Right: I am going a long *way* (not *ways*). Right: There are several *ways* of doing the job.

Weak, week. *Weak* means *not strong. Week* means *seven days.*

Weather, whether. *Weather* refers to *climate. Whether* indicates a *contrasting alternative.*

Who, whom. *Who* is subjective. *Whom* is objective. Right: *Who* is it? *Who* goes there? Right: Of *whom* do you speak?

Who's, whose. *Who's* means *who is.* Right: *Who's* here? *Whose* is possessive. Right: *Whose* book is this?

Woods. Like *falls, woods* is plural. Right: The *woods are* green. Right: The *wood is* green.

Your, you're. *Your* is possessive. Right: *Your* book. *You're* means *you are.* Right: *You're* going.

THESE WORDS AND PREFIXES WILL HELP YOU TO UNDERSTAND THE MEANING OF MANY OTHER WORDS

IMPORTANT LATIN ROOTS, WITH MEANINGS AND EXAMPLES:

alter, other, alternate
ambulare, to walk, amble
amicus, friend, amicable
amor, love, amorous
annus, ring or year, annual
aqua, water, aquarium
audio, auditus, to hear, audience, audible
brevis, short, brevity
cantare, to sing, cantata
capio, captus, to take, captive
cedo, cessus, to go, precede
celer, quick, celerity
centum, a hundred, century
corpus, body, corpse
credo, believe, credible
dexter, right, dexterous
dico, say, diction, dictate
do, datus, give, donate
domus, house, domicile
dormire, to sleep, dormant
duo, two, dual
ego, I, egotism
falcio, facere, factum, to do, make, manufacture
felix, happy, felicity
fero, latum, to carry, ferry, transfer
finis, end, final
frater, brother, fraternal
homo, man
juvenis, young, juvenile
lac, milk, lactate
lego, legi, lectum, to read, lecture
lex, legis, law, legislature
liber, book, library
lingua, tongue, linguistics
locus, place, location
lux, lucis, light
mater, mother, maternal
manus, hand, manual
mare, sea, marine
mirare, to wonder, miracle
mitto, missum, to send, transmit, mission
navis, ship, navigate
nihil, nothing, annihilate
novus, new, novelty
nox, noctus, night, nocturnal
pater, father, paternal
pendo, hang, pendant
pes, pedis, foot, pedal
porta, door, portal
scribo, scriptum, to write, script, manuscript
spirare, to breathe, respire
terra, earth, terrestial
traho, tractum, to draw, tractor, subtract
urbs, city, urban
venio, ventus, to come, convene
vidio, visum, to see, vision
vocare, to call, vocation, convoke
volo, wish, voluntary
vox, vocis, voice

PREFIXES, MEANINGS AND EXAMPLES:

a, ab, away, absent, abduct
ad, to, adhere, adjust
ambi, both, ambidextrous
ante, before, antedate, anteroom
auto, self, automobile
anti, against, antithesis
bene, well, benefit
bi, two, bicycle, bisect
circum, around, circumscribe
con, with, concur
contra, against, contradict
de, from, degrade
dis, away, dismiss
epi, upon, epitaph
ex, from, expel, export
in, not, inconsistent
inter, between, interurban
mono, single, monoplane, monarchy
non, not, nonsense
pan, all, Pan-American
per, through, perspire
peri, around, periscope, perimeter
post, after, postpone, postscript
pro, forward, proceed, propose
re, retro, back, backward, retrograde, rejoin
semi, half, semicircle
sub, under, subnormal, submarine
super, above, superfine, supersede
syn, together, syndicate
trans, across, transfer
tri, three, triple, triplets
ultra, beyond, ultraliberal
un, not, unable, unfit
un, uni, one, uniform, unanimous

Gram'ophone. This apparatus is a modification of the graphophone, and like the graphophone is based upon Edison's phonograph. In the gramophone the cylindrical record is discarded, being replaced by a disc or, rather, two discs. One of these discs is of rubber and generates the sound; the other, upon which the record is written and of which the rubber disc is an exact copy, is of glass, with a lamp-black surface upon which the stylus may write the records. The invention of the disc is due to Emile Berliner (1887). A feature of the gramophone is that the record groove does not only vibrate, but serves to propel the reproducing stylus.

Gram'pians, a mountain system of the Scottish highlands. Some apply it to the chain on the border of the Lowland plain between Dumbarton and Stonehaven, and others include the range from Stonehaven to Ben Nevis. It also is a range in West Victoria, Australia.

Granada (*grä-nä'dà*), formerly a Moorish kingdom of Spain, but now divided, having an area only of 4,937 sq. miles and a population under 500,000. It has been under Spanish rule since 1492.

Granada, capital of the province and, formerly, of the kingdom of Granada, lies at the foot of the Sierra Nevada, on the right bank of the Jenil. It is beautifully situated, about 2,000 feet above the sea. The city has become dull and sleepy, its market and squares, university and jasper and marble-decorated cathedral being its chief objects of interest. The industry and trade amount to almost nothing. The university was founded in 1531 and has several hundred students. It is known, however, to have been one of the most splendid cities of the Old World in the days of its prosperity. It was founded by the Moors in the 8th century, and rapidly became important for art and industry, having a population in 1492 of 400,000. It was surrounded by a strong wall with 1,030 towers. The Moorish palace of the Alhambra (*q.v.*), still beautiful in its ruins, the unfinished palace of Charles V and many other buildings tell of its former grandeur. It was captured by Ferdinand and Isabella in 1492, but still prospered under Spanish authority until the final expulsion of the Moors in 1609, which reduced its population to its present small numbers. The population, according to the census of 1931, numbered 118,905.

Gran Chaco, a vast tract of unsettled land abounding in swamps and dense forests, situated between Paraguay and Bolivia, the sovereignty of which has been a source of contention between the two republics for more than fifty years. The origin of the dispute may be traced back to the indefinite crown grants of Spain in the early colonial days. Today, Bolivia, being cut off from the sea, is fighting for a navigable outlet on the Paraguay River. The seemingly futile conflict is being waged over the rivers which form the claimed boundary of the Chaco. Although the dispute is one of long standing, open war was not declared until May 10, 1933. The constant jungle warfare which has ensued has been a heavy drain upon the vitality and youth of both republics.

The struggle has been marked by a peculiar type of warfare which has been so appropriately termed "jungle warfare." The impenetrable mountain ranges and thick jungles make actual open contact with the enemy impossible. Bolivia is situated a thousand miles from the scene of military operations, only 500 miles of which are covered by railway. The trek through the jungle is accomplished by motor truck and donkey. Thirst and hunger, aggravated by an intense steamy heat, torture the weary troops. Paraguay, however, is more fortunate in being situated comparatively near to the scene of action and transports her troops and supplies by railway, motor truck and mule. Having reached the Chaco region, patrols cut their path through the thicket, employing knife and hatchet, the noise of their manoeuvers finally attracting the enemy's attention sufficiently to disclose their position. After the enemy's position has been detected, trenches are run out by patrols, filled with men and munition and the guerilla warfare is begun. The Bolivian army is under the command of General Hans Kundt, a former German army officer. The Paraguayan forces are under the leadership of a former French army officer.

The first break in the hostilities occurred in December 1932, when Pope Pius arranged a temporary peace between the combatants. Since that date attempts at conciliation have been made by Argentina, Brazil, Chile, and Peru to no avail. In October 1933, the League of Nations undertook the responsibility of sending a league commission to the Chaco. At that time Paraguay proposed an armistice between the two republics in order to facilitate the work of the commission. Bolivia would not acquiesce to such an arrangement. The issue was brought to the attention of the Pan-American Conference at Montevideo in December. On December 10, one of the most decisive battles in the guerilla warfare between the two republics occurred when the forces of Paraguay surrounded and captured about 13,000 soldiers of Bolivia among whom were numbered about 800 officers. Paraguay regarded this victory as the termination of the war. Brigadier General José Felix Estigarribia was promoted to the rank of Major General for his valuable service and leadership in this encounter. Bolivia, faced with depleted forces, accepted the truce proposed by Paraguay. A committee, which was comprised of representatives from Chile, Brazil, Argentina, Mexico, Uruguay, Guatemala and Peru, was appointed by the Conference to discuss with the two warring republics measures for effecting an amicable solution of their differences.

The truce failed to realize the hopes of the Conference. The fruitless armistice terminated on January 6, 1934. The forces of Paraguay resumed their trek and advanced toward La China, marching steadily on toward Cabezón, their goal.

In March the Government of Paraguay rejected the peace proposals of the League of Nations' commission in session in Buenos Aires. The proposals advanced by that body included World Court arbitration of all but the Hayes zone, the immediate cessation of hostilities, and demilitarization. The Paraguayan Government vehemently opposed the proposed arbitration of the coastal region of the Paraguay River with the hinterland. The attitude displayed by Paraguay towards the intervention of the League of Nations and its attempt to effect an amicable settlement in the Gran Chaco dispute resulted in the league's decision to call a special session of the Council and to recall the commission from Buenos Aires. The Gran Chaco dispute has become a problem of the utmost importance to the entire world and is one of the major problems demanding league consideration at the present time.

Grandfather's Chair, two series of stories for children, written by Nathaniel Hawthorne and published in 1841 and 1842. They are chiefly about persons and events well-known in connection with early life in America.

Grand Forks, a city of North Dakota, is situated at the junction of the Red Lake River and the Red River of the North. It is served by the Great Northern and Northern Pacific Railroads. Grand Forks is in the center of a rich timber and grain district. The principal industries include flour mills, packing plants, butter, bricks, candies, ice cream, beet sugar manufacture, sash, doors, cigars, printing plants, bottling works, creameries, foundries, and furriers. The water supply is excellent, and with the electric light supply, is owned by the township. The city was founded in 1871, and in 1884 was made the seat of the University of North Dakota. Its growth was rapid between 1890 and 1900, in which time it almost doubled its population. In 1930 the population was 17,112.

Grand Island, an important city and the seat of Hall County, Nebraska, is situated on the Platte River, about 125 miles southwest of Omaha. The principal industries of the city are foundries, railway shops, brickyards, and beet-sugar factories. Large numbers of sheep and cattle are raised in the vicinity about Grand Island.

Grand Island College, a Baptist institution founded in 1892, and the State Soldiers' and Sailors' Home are situated here. A Normal College was opened here in 1890. The city was first settled in 1857. It was incorporated in 1872. In 1930 the population was 18,041.

Grand Rapids, an important manufacturing city and the seat of Kent County, Michigan, is situated thirty miles from Lake Michigan and about sixty miles northwest of Lansing on the Grand River. A dam has been constructed across the river at this point, and the water power derived from it is considerable. Direct water transportation with Chicago, Milwaukee, and other important cities is afforded by the ideal location of the city. The city is situated in the heart of western Michigan's fruit belt and resort section. It is served by the Pennsylvania and other important railway lines. Both steam and motor truck lines connect it with nearby commercial cities and important ports along Lake Michigan.

Grand Rapids is especially famous for its large furniture manufacturing interests. There are seventy-two furniture factories employing more than 13,000 men. This city is the largest employer of skilled furniture workers and produces more than two and one-half times as much furniture as its next nearest competitor. The furniture markets, held semi-annually, is attended by representatives of the furniture industry from all sections of the country. Huge factories manufacturing school-seats, window-sash, pulleys, showcases and refrigerators are situated here. Large supplies of gypsum products are also produced in this city, gypsum mines being located just south and west of the city.

The city covers an area of about twenty-three square miles. Since 1923 Grand Rapids has enjoyed a zoning ordinance which limits the height of buildings and the portions of land area they may occupy. Certain sections of the city have been zoned for residences, business, and industry.

The Grand Rapids Municipal Airport is situated four miles south of the city. It is one of the most completely equipped airports in the United States. The airport is situated on county-owned property. It is under the lease of the Grand Rapids Flying Club.

The principal thoroughfare is Monroe Avenue. It extends about one-half mile north of Campau Square, the heart of the business section of the city. The city has well developed banks, schools, wholesale houses, and well planned theatres and recreational facilities. In 1930 the population was 168,592.

Grand River, in southern Ontario, empties into Lake Erie at Port Maitland, and is navigable for a considerable distance. It is 150 miles long. Flora, Paris, Brantford, Cayuga and Dunnville are on its banks. In early days, when the whole country was wooded, small vessels made use of it in carrying merchandise and farm and timber products. It waters a fertile and quickly settled country.

Granite, a crystalline, igneous rock, is composed chiefly of quartz and feldspar, with which are associated mica or hornblende or both. Other minerals are sometimes associated in small quantities. The lava which became granite was not poured out on the surface, but cooled and crystallized far below the surface under great pressure. If it now appears at the surface, as it does in many places, it is because the rock which originally overlay it has been removed by erosion. Only those lavas which have such composition as to give rise to the above minerals produce granite, and these only when the lava solidifies under the proper conditions. Granite contains sixty-two to seventy-five per cent of silica. Granite belongs to no particular age, but has originated in all ages and may be forming now, far beneath the earth's surface. Granites usually are grayish or reddish in color. The red color is due to the feldspar, which sometimes has this color. If this mineral be white, its combination with the black or dark colors of the mica and hornblende produces a grayish effect. Granite is extensively used for buildings and monuments, its value depending on its durability, color and susceptibility to polish. Its hardness and the consequent difficulty and expense with which it is worked prevent its use for the commoner sorts of stone-work. In the United States granite is extensively worked in New England, but it also occurs and is worked to some extent in many other states.

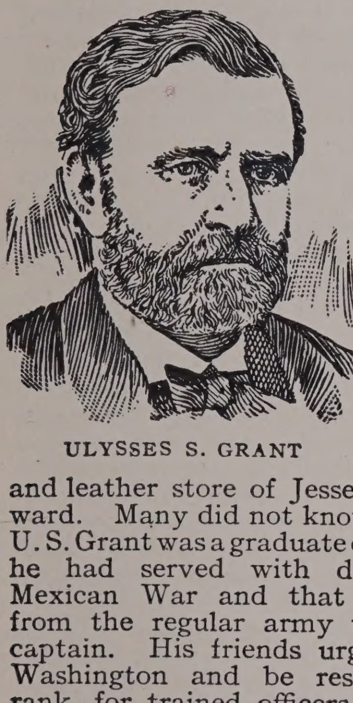
Granite City, a thriving city of Madison County, Illinois, is situated directly opposite St. Louis, Missouri, near the Mississippi River. The principal products of the city are iron, steel, tin plate and granite ware. Well developed bridge works, a large corn products refinery, and a sheet-lead mill are also operated here.

The city was first settled in 1892. A charter was granted the town in 1896 under which the town is still governed by a mayor and council who are elected every two years. In 1930 the population was 25,130.

Grant, George Monro, D.D., Canadian educator and clergyman and principal of Queen's University, Kingston, Ontario, was born near Pictou, Nova Scotia, on December 22, 1835 and educated at Pictou Academy and at Glasgow (Scotland) University, where he carried off the Lord Rector's prize and high honors. In 1860 he was ordained a minister of the Church of Scotland and had appointments at Georgetown, Prince

George M. Grant

Edward Island, and at Halifax, Nova Scotia. In 1872 he accompanied the Canadian engineer, Sir Sandford Fleming, on his overland journey to British Columbia, the result of which was embodied in an entertaining book, entitled *Ocean to Ocean.* In 1877 he became principal of Queen's College, Kingston, Ontario, for the endowment of which he has raised over $400,000, and by his learning and unique personality raised it to a high status among Canadian universities. He served as president of the Royal Society of Canada and as moderator of the general assembly of the Presbyterian church of Canada, and held the degree of LL. D. from Dalhousie and Toronto Universities. His other writings include *Advantages of Imperial Federation, Our National Objects and Aims, The Religions of the World,* etc. A man of powerful personality, marvelous versatility and indomitable perseverance, coupled with deep religious convictions, Principal Grant's death, which occurred in 1902, was a distinct loss, not only to the institution of which he was the head but to the Canadian people at large.



ULYSSES S. GRANT

Grant, Ulysses S* When news that Fort Sumter had been fired on was flashed over the wires, in April, 1861, meetings were held in every city and village in the north, and volunteers by thousands offered their services in defense of the Union before President Lincoln issued his first call for troops. At a meeting in Galena, Illinois, a middle-aged clerk in the hardware and leather store of Jesse Grant came forward. Many did not know, until then, that U. S. Grant was a graduate of West Point, that he had served with distinction in the Mexican War and that he had resigned from the regular army with the rank of captain. His friends urged him to go to Washington and be restored to his old rank, for trained officers were in demand, and his rise would be rapid. It was characteristic of him that he did not think of his own advantage, but organized a company of volunteers and went with it to the state capital. Politics and self-seeking were foreign to his nature. Sheer ability and devotion to duty carried him to the top.

Born on April 27, 1822, on a farm near Point Pleasant, Ohio, the boy was named Hiram Ulysses. An error in his papers when he entered West Point Military Academy in 1839 dropped the Hiram and substituted Simpson, his mother's maiden name. He reported the error, but it was never corrected. Upon his graduation in 1843 he was sent to Jefferson Barracks, Missouri, and thence to the Mexican War where he won two brevets for gallantry. In 1848 he married Julia B. Dent, the sister of a classmate, in St. Louis, and saw several years' service in California in gold-fever days. In 1854 he resigned and retired to a farm near St. Louis, at the same time opening a real-estate office in the city. Like so many other great men Grant was a failure in business. He got into debt, and was glad to take a place as clerk in his father's store in Galena.

In May, 1861, Grant was appointed Colonel of the Twenty-first Illinois Infantry, and in August he was made brigadier-general of volunteers and given command of southwestern Missouri, with headquarters at Cairo. From the start Grant's policy was strategic and aggressive, qualities which marked his whole career. He at once took possession of Paducah, a move which secured Kentucky to the Union. On Nov. 1 he routed the Confederate garrison at Belmont Mo., a result which checked the advance of a Confederate force under General Price. In Feb., 1862, he captured Fort Henry on the Tennessee and Fort Donelson on the Cumberland, the latter after a three days' siege which resulted in the unconditional surrender of the garrison with 14,000 prisoners. This important victory broke the Confederate lines, and secured Federal control of western Kentucky and Tennessee. Grant was now made major-general of volunteers and given command of western Tennessee. On April 6th he fought the battle of Shiloh (which see), one of the severest engagements of the war. During the summer he fought the minor battles of Iuka and Corinth. He then determined to capture Vicksburg and thus open the Mississippi. The high ground east of the city offered the only favorable point of attack, but failing, after months of effort, to secure a foothold there, Grant transferred his army to the west side of the river and marched through the swamps to a point below the city, while Commodore Porter's fleet of gunboats, with the transports, ran past the Confederate batteries. Again crossing the river 30 miles below Vicksburg, he pushed rapidly between the armies of Johnston and Pemberton, defeating them separately and driving the latter into the defenses of Vicksburg. This stronghold, after a siege of six weeks, was surrendered July 4, 1863, with its garrison of 32,000 men. Grant's next campaign was for the relief of Chattanooga, where the Federal army, beaten at Chickamauga, was besieged and practically cut off from supplies. On Nov. 23rd to 25th the battles of Lookout Mountain and Mission Ridge were fought, resulting in the defeat of the Confederates. In March, 1864, Grant was made lieutenant-general and placed in command of all the Union armies. He now planned a wide campaign which should press the Confederates simultaneously at all points east and west. Leaving Sherman to fight Johnston from Chattanooga to Atlanta, he himself with the Army of the Potomac confronted the Confederates under General Lee. The clash of these great leaders came in the terrible battles of the Wilderness, Spottsylvania, North Anna and Cold Harbor and, finally, in the siege of Petersburg, which ended in its fall, the capture of Richmond and the surrender of Lee at Appomattox, April 9, 1865.

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*As a matter of curious interest U. S. Grant Jr. informed the Editor that the S was always written without a period and that while it may have meant "Simpson" it was never so written.

The war was over. Grant, hailed as the nation's deliverer, went immediately to Washington to hasten the disbanding of the army. He was created General, a higher rank than had hitherto existed in our army. His magnanimity toward his late foe won the gratitude of the south. He threatened to resign, if President Johnson had Lee tried for treason. In 1868 General Grant was elected President.

"The man on horseback" is not always a successful executive. But General Grant made up for his lack of experience in public office by his personality. In the president's chair he displayed the same characteristics that he had in the field. Self-reliance, prompt decision, willingness to assume full responsibility, moral and physical courage, devotion to duty, simplicity, purity of personal life and unimpeachable honesty marked him. Honest himself, he reposed complete confidence in those around him, and was sometimes betrayed. The eight years of his presidency covered the difficult period of reconstruction in the south, the adoption of the 15th Amendment, the financial crisis of '73, the completion of the Union Pacific Railway and the Franco-Prussian War. Mistakes were made — errors of judgment deplored to-day, but, in the midst of the turmoil, Grant secured the passage of the first Civil Service reform bill and a treaty with Great Britain defining the rights and duties of neutral nations in time of war.

In 1877 General Grant made his famous tour of the world, in which Occident and Orient were in rivalry to do him honor. At the age of 56 a man of enduring fame, he was too poor to maintain his family in its enforced prominent position. Investing his capital in the banking firm of Grant and Ward, with his usual trust in his associates and his ignorance of business, he left the conduct of the enterprise to his partners. The firm failed, Grant was robbed and left penniless. A fall had crippled him, so that, at this time and until his death, he had to use a crutch.

Nothing in all the career of this great American is so heroic as the closing year of his life. Bankrupt, crippled, dying of cancer of the tongue, he dictated two volumes of memoirs to provide for his family. When it was absolute agony to speak, with a fortitude and unselfishness that have few parallels in history, he continued his task, completing it only four days before his death at Mt. McGregor, near Saratoga, N. Y., July 23, 1885.

Of the literary quality of these *Memoirs* it is enough to say that Edward Everett Hale asserts that "no prose writer of our country is more likely to be generally read three centuries hence than the despatches of Grant;" and Matthew Arnold, a severe critic, declared that the style of Grant's *Memoirs* equals that of Cæsar's *Commentaries*. See *Personal Memoirs.*

Gran'ville, George Leveson-Gower, Earl of, English statesman of the Liberal school, was born at London, May 11, 1815, and died there on March 31, 1891. After an education at Eton and at Christ Church, Oxford, he acted under his father as attaché at the English embassy in Paris, and in 1836 entered the house of commons, becoming under-secretary of state for foreign affairs. In 1846, on the death of his father, he entered the house of lords, and in 1851 succeeded Palmerston as secretary of foreign affairs, and became president (from 1852 to 1854) of the council. In 1868, under Gladstone, he was secretary of state for the colonies, and during 1870–74 was once more secretary for foreign affairs. The latter office he also held under the same premier during the years 1880–85.

Grape, species of *Vitis*, a genus which contains about 40 species belonging to temperate and subtropical regions. About 25 species are found wild in the United States. The group is said to be the oldest of domesticated fruits, and the original wine-producing form is *V. vinifera*, which probably was native to Asia. Although the production of wine is the principal use of the grape, the production of raisins is an important industry. The American species which has been most developed is *V. labrusca* of the Atlantic region, which is the parent of the well-known Concord and Catawba forms. The Delaware and Isabella grapes are said to have varied so far from the original types that they cannot be recognized. While in the eastern and southern United States the native grapes were being domesticated, in California the Old World *V. vinifera* was introduced, and therefore the Pacific grape culture is that of the Old World. Outside of California, the most important regions of grape-culture are in New York and Ohio along the lakes and rivers. There also are important grape-plantations in

Ontario, Michigan and the cooler parts of Georgia and Alabama.

Grape-Fruit, a species of *Citrus*, to which oranges and lemons belong. The species is *C. decumana*, and it is popularly known by the names pomelo and shaddock as well as grape-fruit. It is native to the Malayan and Polynesian islands, and seems to be most extensively cultivated in India, Florida and California, although of general occurrence in tropical and subtropical countries. The ordinary globular forms of the market are pomelos or grape-fruits, while the pear-shaped shaddocks are seldom found in the markets.

Grape Phyl′loxe′ra, a small insect with sucking beak, that is very destructive to vineyards. It belongs to the plant-lice. Its injuries have been most extensive in France, and many memoirs have been written about it. There are two forms, one attacking the roots, the other the leaves. They produce swelling on the root and galls on the leaves. It has been combatted with only partial success.

Grape-Sugar. See GLUCOSE.

Graph′ite. Graphite is a relatively incombustible form of carbon. It occurs chiefly in association with highly metamorphic rocks, and is supposed to be of vegetable origin. Highly metamorphic coal sometimes becomes graphitic; that is, coal may be so metamorphosed as to be partially changed into graphite. Some of the coal of Rhode Island is graphitic. The principal use of graphite is for the manufacture of crucibles and pencils. In the manufacture of crucibles it is mixed with clay, and its value for this purpose depends on its infusibility. Only the finer grades of graphite are used in the manufacture of pencils, and for the manufacture of the best grades of pencils the graphite must be carefully freed from all impurities. Graphite is used in limited quantities for many other purposes, as stove polish, lubricants for machinery, etc. In 1906 the total product from the United States was 19,097 tons. The commercial product was derived from Alabama, Michigan, New York, Pennsylvania and Rhode Island. The largest and purest supply of the United States comes from Ticonderoga, N. Y. Canada also produces graphite. The value of graphite depends largely upon its purity, the highest grades being of great value.

Graph′ophone. An instrument invented by Charles S. Tainter and Chickester A. Bell for reproducing sounds, particularly human speech and music. It is much the same in principle and construction as the phonograph invented by Edison, but has minor mechanical advantages, for example, a wax-coated cylinder instead of one made entirely of wax.

Graph′otype. This is a process which makes it possible for the artist actually to draw his own engravings, instead of having them merely copied for printing. The original method dates from 1860, when De Witt C. Hitchcock used an ink made of lampblack and glue upon a surface of compressed French chalk resting on a zinc plate. When the uninked chalk has been removed, the remainder may be hardened in a silicate, and the picture is then electrotyped.

FLOWER

Grass. The usual name of members of the family *Gramineæ*, which is one of the largest and certainly one of the most useful groups of plants as well as one of the most peculiar. Grasses are world-wide in their distribution, and are remarkable in the display of individuals, commonly growing so densely over large areas as to form a close turf. Associating with them the sedges, which resemble them in habit, there are about 6,000 species. Here belong the various cereals, as wheat, barley, rye, oats, rice etc.; also sugar-canes, sorghum, bamboos and pasture-grasses. The flowers are small, having no floral leaves and consisting chiefly of three stamens surrounding a single pistil, whose ovary ripens into the grain or characteristic seed-like fruit of the group. One of the most noteworthy features of the group is the prominent development of peculiar bracts in connection with the flowers. Each flower is completely protected or even inclosed by one or more of these bracts; and, as they usually overlap one another, the flowers are invisible until the bracts spread apart to permit the long dangling stamens to appear. These bracts are the so-called chaff of wheat and other cereals, and by botanists are called glumes, those glumes most closely associated with the flowers being the palets. In the temperate regions grasses for the most part are lowly plants, while in the subtropical and tropical regions they rise until such forms as the canes and bamboos form growths that may be called forests. The ordinary grasses of the United States may be roughly grouped as turf-forming grasses and bunch-grasses. The former spread by creeping rootstocks, and soon form a compact mat or turf. Such grasses are naturally the most suitable for lawns and pastures. The bunch-grasses are more characteristic of poor soils or of dry regions, and occur abundantly on our western plains, growing, as the name suggests, in clumps or stools.

Grass'hopper, a very common jumping insect belonging to the group (*Orthoptera*) containing crickets, cockroaches, katydids and others. These insects are world-wide in their distribution, and those with short antennæ are properly called locusts. The locusts of the Bible and the great clouds of locusts mentioned in history were grasshoppers. In the United States the name locust is improperly given to the seventeen-year cicada. Grasshoppers have four wings, the outer ones hard and the flying wings underneath them folded like plaits of a fan. They have biting jaws, and eat, sometimes insects, but more commonly vegetables. The males make sounds by rubbing the spiny surface of the thighs against the wing-covers; the cracking sound given out by some grasshoppers while flying is due to rubbing the upper surface of the flying wings against the lower surface of the wing-covers. Their eggs are laid in groups in the ground, in fence-posts, logs, stumps etc. The destruction of crops by the small Rocky Mountain locust is historical. These insects appeared in great numbers, and not only destroyed the corn and other crops, but stripped the leaves from the trees. From 1874 to 1876 this insect damaged western agriculture to the extent of more than $200,000,000, working especial harm in Kansas, Nebraska, Colorado, Missouri and Iowa. The United States government appointed an entomological commission in 1877 to study the problem, and these pests were combated by burning over the breeding-grounds, destroying the young in ditches by burning straw and by other means. Of other forms that do much damage, mention may be made of the American locust, which devastates our southern states; and of the differential locust, very injurious to cotton-plantations in Mississippi.

See *Reports of the Entomological Commission* for 1878–79 and 1880–82; Sanderson: *Insects Injurious to Staple Crops;* Mary Treat: *Injurious Insects of Farm and Garden;* Howard: *The Insect Book.*

Grat'tan, Henry, a great Irish patriot and orator, was born at Dublin, July 3, 1746. At seventeen he entered Trinity College, and at twenty-one Middle Temple, London, to study law. In 1772 he was called to the Irish bar, and soon after was elected to parliament, where he took the place of Henry Flood, who had lost his popularity by taking office under the government. The country was in a poor condition on account of loss of trade with America, and the restriction of Irish trade, and he at once set about the effort to reform. He then cherished the idea of a separate parliament, and on April 19, 1780, after fifteen hours' argument and perhaps the best speech of his life, an indefinite adjournment was taken. A month later the Rockingham ministry apparently acquiesced, but his friend Fox asked for more, and the point for which Grattan so long strove was lost. In 1790 he was returned to parliament for the city of Dublin, and took up the cause of Catholic emancipation, labored heart and soul in the effort, but was overcome by circumstances that ended in the revolution of the United Irishmen in 1798. He retired to private life, broken in health, until in 1806 he appeared in the English house of commons as a member for Dublin, only again to work for his former cause. On May 20, 1820, he crossed from Dublin to make his last appeal, but arrived dying, and expired at London, June 4, 1820. Grattan's figure was small and spare, his face long, thin and slightly marked with smallpox. His gestures in speaking were violent and odd, and his voice of no great power, but he wielded his hearers at will by his energy, passion and overpowering earnestness and enthusiasm. See Lecky's *Leaders of Public Opinion in Ireland.*

Gratz (*gräts*), the capital of Styria in Austria, is built on both sides of the River Mur. Its fortress was demolished by the French in 1809. It has many old buildings — the fine Gothic cathedral (built in 1462), a Gothic church (dating from 1283), the university (founded in 1586) and four monasteries of the 16th and 17th centuries. The university has a teaching staff of 147 with 1,971 attending students. In 1481 it repulsed the Hungarians and in 1532 the Turks, but was taken by the French in 1797 and 1809. It has important manufactories of machines, steel goods, rails, railroad-cars, sugar, wine, candles and soap. Population 138,080.

Grav'el. The term gravel is applied to aggregations of small, water-worn stones of any kind. There are no definite limits to the size of the constituents. Fine gravel grades into coarse sand, and coarse gravel grades into shingle or aggregation of cobble-stones. Gravel occurs frequently along swift streams and the shores of lakes and oceans. When cemented into rock, gravel becomes conglomerate.

Gravelotte (*gräv'lŏt'*), a village in Lorraine, near Metz, where, on Aug. 18, 1870, the French under Bazaine were defeated by the Germans. The French loss was about 15,000, that of the Germans 20,000.

Gravita'tion, that property of matter in virtue of which every particle in the universe attracts every other particle. The name (from the Latin *gravis*, heavy) is due to the fact that the most familiar illustration of gravitation is the attraction which the earth exerts upon all bodies at its surface. The force with which the earth attracts any body is called the *weight* of that body. About 1665 Newton suspected that it is the attraction of the earth upon the moon (or the weight of the moon) that retains the moon in her orbit. He proceeded to compute the period of revolution of the moon on this hypothesis, and found, after getting correct data, that this period is very exactly that of the lunar month.

Later he showed that the attraction of the sun on the planets, according to the same laws, would account for all the planetary motions. Recent observations apparently show that the ordinary laws of gravitation hold even in the case of double stars, bodies entirely outside the solar system. The principal facts known concerning gravitation are the following: 1. The force of attraction between any two particles varies directly as the product of the masses of those particles. 2. The force of attraction between particles varies inversely as the square of the distance separating these particles. 3. The force of attraction is independent of the kind of matter composing the particles and independent of the medium between the particles.

These laws may all be summarized in the following equation. Let m and m^1 represent the masses, r the distance separating them and F the force of attraction. Then

$$F = G\frac{m^1}{r^2}$$

where G is a constant known as the gravitation constant. The exceedingly accurate measures of C. V. Boys give for this constant the value, $6.6576\text{x}10^{-8}$. The equation for F, just given, is known as Newton's *Law of Universal Gravitation.* No satisfactory explanation of gravitation has ever been suggested. Newton pointed out very clearly that his law describes the facts, but does not explain them. Among the most important inferences which may be drawn from Newton's law are: (1) Kepler's three laws; (2) the fact that a homogenous sphere acts as if its entire mass were concentrated at its center; and (3) the attraction of a homogenous sphere on a particle lying anywhere between its center and its surface varies directly as the distance of the particle from the center.

Gray, Asa, American botanist, was born at Paris, N. Y., Nov. 18, 1810; became a physician in 1831; but soon abandoned medicine for the study of botany. He was appointed botanist of the United States exploring expedition to the southern seas in 1834, but resigned before setting out in 1837. In 1842 he became professor of natural history at Harvard, and remained until 1873. In 1874 he became regent of Smithsonian Institute, succeeding Agassiz. Besides many textbooks, now in use in all schools, he wrote *Examination of Darwin's Treatise; Darwinia*; and *Natural Science and Religion.* He died Jan. 30, 1888. He ranks among the leading botanists of the age. He was very successful as a teacher and through his books in imparting the first principles of botany to beginners. He also was the first in America to arrange the species of plants in accordance with the natural system of arrangement which has taken the place of the older system of Linnæus.

Gray, Horace, American jurist and associate-justice of the supreme court of the United States, was born at Boston, Mass., in 1828, and graduated from Harvard. After studying at Harvard Law School he was admitted in 1851 to the Massachusetts bar, and for seven years (1854–61) he acted as reporter to the supreme court of the state. From 1873 to 1882 he was chief-justice of the supreme court of Massachusetts, and in the latter year was elevated to the supreme court of the United States, as one of the associate-justices. He died on Sept. 15, 1902.

Gray, Thomas, one of the foremost English poets, was born at London, Dec. 26, 1716. His father's violent temper had forced his mother to leave him, and Thomas was brought up by his mother and her sister, of both of whom he was passionately fond. At school, at Eton, he met his best friend, Horace Walpole, who at once took a fancy to the shy and studious boy. At Peterhouse, Cambridge, he greatly disliked mathematics, which then was the chief study there, and after some four years of university work he was easily persuaded to spend two years and a half in travel with Walpole. On reaching home he began to write poetry. The next spring (1742) he went back to Cambridge, took his degree in civil law, and as a resident-student spent there the most of his life, though he afterward left Peterhouse for Pembroke Hall, because of a practical joke played on him by some of the students. He took the keenest pleasure in the company of his friends. His holidays were spent with his mother at Stoke Pogis or with Walpole at London. His *Ode on Eton College* was printed in 1747. The death of his aunt seems to have brought his mind back to a projected work which was soon to bring him fame — his *Elegy in a Country Churchyard.* This poem he had begun on his return from the trip with Walpole, and had then thrown aside. The poem was sent to Walpole, was handed about in manuscript, and soon became so well-known that Gray was forced to print it in 1751. This stately poem is perhaps the best-known piece of English verse. Wolfe said he would rather have written it than capture Quebec. Three years later appeared his *Pindaric Odes* and *Progress of Poesy.* Perhaps his greatest work followed after another three years had gone by — *The Bard.* His studies of Icelandic and Celtic verse bore fruit in *The Fatal Sisters* and *The Descent of Odin.* In 1768 he was made professor of history and modern languages at Cambridge. Dr. Johnson said of Gray that he "was a man likely to love much where he loved at all." He was, however, greatly subject to fits of melancholy. Yet no poet was ever happier in his friendships or better beloved. It has been said of him that "he had little to say and took his time to say it." He certainly did not write much, but on the strength of what little he cared to write he has taken high rank among his fellow-poets. He died on July 30, 1771.

Great Basin, a triangular plateau, covering the western part of Utah, nearly the whole of Nevada and part of California and Oregon, and extending into Idaho, lying between the Wahsatch and the Sierra Nevada Mountains. It stretches about 500 miles along the base of the triangle from east to west and 800 miles from north to south. It is traversed by mountain ranges and covered by many streams and lakes, mostly salt, that have no outlet, but either drain by evaporation or sink into the sands of the desert.

Great Bear Lake, a lake in northwestern Canada, is the most northerly of the large bodies of fresh water. It is 246 feet above the level of the sea, very irregular in shape, with an area of about 11,200 square miles. A river of the same name flows from it into the Mackenzie. It is crossed by the Arctic circle, and therefore is frozen half the year. Immediately above it, in the Polar sky, is the constellation of the Great Bear—hence its name. About it is the largest tract of unexplored land on the continent. This is the country of roving Eskimos. It is the source of the Coppermine and Great Fish Rivers. The lake is said to teem with herring.

Great Britain, the largest island of Europe, and the name commonly applied to the United Kingdom of Great Britain and Northern Ireland. It lies west of continental Europe, and is bounded on the north by the Atlantic; on the east by the North Sea; by the English Channel on the south; and on the west by the Atlantic, the Irish Sea and St. George's Channel, thus forming the largest island area of Europe. It was called Great Britain to distinguish it from the smaller Brittany in France. The name, however, was used only in a poetical sense until James I styled himself King of Great Britain. Great Britain covers an area of 89,041 square miles with a total population (1931) of 44,932,884, including England, Wales, Scotland, the Isle of Man, and the Channel Islands.

Surface. The surface formation is rugged and uneven. The northern part of the island is covered by scattered, irregular mountainous groups that form no regular chain or system, but look much as if a bunch of round-shouldered, flat-topped humps had been placed here and there at random. To the south the nature of the country becomes more level, and this tendency prevails until the hills and mountain systems of Wales are reached.

The geological formation of Great Britain has formed an interesting study to scientists for many years. Every period of the formation of matter and solids is found in different parts of the island, varied formations and varieties of rocks and minerals being distributed from end to end and from shore to shore. In nothing has Great Britain more wealth than in its coal and iron. The iron is more an industry of the last hundred or more years. Iron ore is chiefly found in connection with the coal beds, but much of it, in the form of red and brown hematite is mined in the rock and limestone formations. Copper and tin and zinc are also extensively mined.

Climate. The climate, as that of no other country in a like latitude, derives its peculiarity from its situation and from the prevailing winds, which are from the southwest, except in the months of April and May. The thermometer for six months in the year ranges near sixty degrees, and seldom, if ever, drops below thirty-six degrees during the remaining six months, thus affording, according to all authorities, one of the healthiest climates in the world.

Industry. Business and industry are showing clear signs of revival in Great Britain. The shipbuilding and building industries have shown the most marked improvement. The British Government has waited long for the basic industries to "reorganize and rationalize themselves voluntarily." As a result of their failure to do this, the Government has taken steps to compel such reorganization. The system may prove to be somewhat similar to the National Recovery Administration of the United States. On March 29, 1934, Sir Henry Betterton, Minister of Labor, announced that the first steps in the experiment will begin with wages in the cotton and textile industry. A wage scale is to be determined by both manufacturer and employé which will be given statutory rating. It is expected that later wage scales may be agreed upon for the coal and steel industries.

In 1932 the National Federation of Iron and Steel Manufacturers was organized at a time when the National Government refused to grant the steel industry a measure of protection unless that industry could give evidence of an efficient reorganization. Upon the formation of the National Federation the Government granted the industry a thirty-three and a third per cent tariff, from which steel used in shipbuilding was excepted, provided that a reorganized plan was evolved which would be acceptable to both the steel industry and the Government. A scheme was developed during 1933 by the committee which proved acceptable to the National Government, but was rejected by the steel industry. In the early part of 1934 another scheme was outlined which in reality is but a reconstruction of the National Federation. This time the plan met the demands of both Government and industry concerning price control and efficiency.

In the future the National Federation of Iron and Steel Manufacturers will be a central body having a governing body of about sixty members. The board will be assisted by ten regional committees and fourteen trade associations. Twenty-eight members of the governing board will be from the regional committees representative of steel manufacturers. Steel users will be represented by a board of about thirty members from the trade associations.

The functions of the Federation will be to give information, conduct research work, collect statistics, control steel imports, co-ordinate the price lists of the various associations and act in the capacity of a tribunal to arbitrate on disputed points in the steel industry. Federation membership will be open to all steel producers in the British Dominions.

Trade. In dealing with foreign trade Great Britain has adopted a policy of concluding reciprocal agreements with foreign nations. Imports in January, 1934, exceeded those of January, 1933, by £10,500,000. There was an increase of £2,400,000 in exports for this same period. Great Britain's imports consist chiefly of raw materials, raw wool in particular.

Great Britain has vied with Japanese competition in foreign markets for many months. The Government and Lancashire mill owners have long expressed anxiety over the trade invasion by a competitor that has unfair advantages in much lower wage rates, longer working hours and subsidized shipping. A British-Japanese trade conference convened in London in February. Textile manufacturers of both nations were represented at the conference. Negotiations were pending for five weeks. At the close of the session on March 14, it was revealed that an agreement between the two countries was impossible. Sir Thomas Barlow, a Board of Trade official, represented the British Government at the Conference. He clearly pointed out that the world export trade in cotton goods up to 1929 amounted to 8,000,000,000 square yards annually. Since that year the cotton trade has decreased to 5,000,000,000 square yards. It is significant, moreover, that during this period of decline, Japan is the only nation that has witnessed an increase in exports.

British delegates at the Conference suggested dividing the world market. Japanese representatives, however, most emphatically refused to consider such an agreement, asserting that Great Britain was competent only to make agreements for the British Isles and crown colonies. Japan even excluded British Dominions from any agreement which might be concluded, insisting that such dominions have their own fiscal autonomy and that London agreements are not binding to British Dominions. The question of unfair Japanese competition is still a source of distress to Great Britain with the possibility of a trade war for the world's markets hovering over the future.

On February 16, a temporary commercial agreement was signed at the British Foreign Office between Great Britain and the Soviet Union. The new Anglo-Russian Trade agreement is somewhat similar to the pact concluded in 1930 but which was denounced in 1932. This former agreement failed to function satisfactorily because of the difficulties encountered in the application of the most-favored nation provisions of the pact and the friction resulting from the timber preferences made with Canada at Ottawa. The 1934 Agreement has been framed with the idea of eliminating these difficulties. The most-favored nation clause is now constructed so as to provide for negotiations on questions concerning extremely low prices. This clause is further qualified by an article which provides that "either party may represent to the other that such prices are being created or maintained as to frustrate preferences or injure home production." If after the necessary negotiations have been entered into and still no agreement between the two nations is effected, the nation having instituted the complaint may "remove the most-favored nation treatment in respect of the goods in question, three months after representations were first made."

The Anglo-Soviet Trade Agreement is a new experiment in international trade. It has been difficult to conclude a satisfactory trade agreement with Soviet Russia because of the fact that all foreign trade, commerce and production in the Soviet Union are under State monopoly. Under Article 3 of the Agreement it is stipulated that the proceeds of Russian sales in Great Britain must be spent in Great Britain in "gradually increasing proportion until an approximate equality of payments is attained between the two countries." No provision has been made in the pact for a loan, but trade between Great Britain and the Soviet Union will be eligible for export credit facilities on exactly the same basis, commercially and financially, as is trade with other countries. The commercial pact is but temporary and is subject to two months' notice by either party.

During February, at the session of the Federation of British Industries, the necessity of modifying the most-favored nation principles if a development of British industry was at all expected, was outlined. Such a development "can not be accomplished without an active export trade." Great Britain and France have been entangled in a trade dispute for several years. At the present time negotiations are under way for a new and effective trade treaty Great Britain has been interested chiefly in having France remove or reduce the high surtax which was imposed on imports shortly after Great Britain went off the gold standard. France agreed to such a reduction on several articles, but when the list was published Great Britain discovered that many important commodities had been omitted. A twenty per cent supplementary tariff was imposed on certain French goods. On February 13, France denounced the trade treaties of 1826 and 1882 and declared them ineffective three months after notice of denunciation had been given.

Naval Policy. A naval construction program was recently announced by the British Government which it is believed is within the limits allowed by the London naval treaty. It provides for the construction of four cruisers, three of the new Minotaur type and one of the Arethusa type; eight destroyers, and one aircraft carrier; three submarines, one for mine laying, two of patrol type; and several smaller ships to be used as patrol boats, mine sweepers, and net layers.

The British Admiralty has seen fit in recent months to protect its trade channels in the Far East. A conference was held at Singapore in January to consider problems of common defense. Representatives of the British, New Zealand, and Australian navies were present. The naval base at Singapore is being strengthened to the point of resembling a veritable fortress. The island of Palaubrani "has three of the greatest pieces of ordnance in the world, capable of outranging the biggest naval guns afloat.

Shipping Merger. On February 9, the Cunard and White Star, two great shipping lines, were merged. The new line will be known as the Cunard-White Star, Ltd. Its fleet will consist of twenty-five ships under the leadership of the Berengaria and Mauretania, Cunard liners, and the Majestic and Olympic, White Star liners.

Great Britain has appropriated $15,000,000 for the construction of a 70,000 ton liner with which the Government hopes to regain its former ascendancy on the Atlantic. An additional $7,500,000 has been granted the new shipping line to be used as "working capital."

Unemployment Relief. The Unemployment Bill was the major topic of discussion in the third session of Parliament which opened in London on November 21. After due consideration it was submitted to the committees in the House of Commons. The bill is divided into two parts. The first part of the bill is concerned with unemployment insurance while the second part deals with the meting out of assistance to the unemployed.

Under the bill the unemployed are separated into three classes: (1) insured workers; (2) persons who have allowed their insurance to lapse and are receiving relief; and (3) the pauper group which is composed of persons considered unemployable who are receiving relief. Those persons coming under either of the first two categories may, under the terms of the Unemployment Bill proposed by the Government, be excluded from relief rolls if they persist in refusing to attend the educational centers which are to be instituted. A dominant feature of the bill is its seeming radical departure from the age-old system of local control in the relief of able-bodied unemployed. The bill was designed by adherents of the principle that the burden of relief is a national rather than a local responsibility and who have, therefore, supplanted the authority of local bodies with an autocratic central control. This is one of the most extraordinary and considered by many as revolutionary, phases of the bill. For centuries even prior to the reign of Queen Elizabeth, local authorities have maintained the control of relief legislation. Destitute folk in the early days of England were cared for by their local parish. In 1934, however, such a system of relief has been found inadequate in view of the widespread distress which unemployment has caused and which the local authorities have been unable to cope with. Money grants of successive governments have proved insufficient for those districts which have been overburdened with a vast number of unemployed. Local authorities were unable to deal efficiently with the problem. A government appeal to the more prosperous areas to aid the distressed areas brought little or no response. It was in the face of such conditions that the government evolved its plan of social legislation for assuming the responsibilities of relief and solving the annoying problem.

The bill provides for the creation of an Unemployment Assistance Board which will consist of no more than five members. This board will represent the autocratic central authority over a new body of local officials. It will supervise the relief of all needy persons, with the exception of the sick, aged, and infirm, between the ages of sixteen and sixty-five. Local authorities will retain the responsibility of maintaining public health, educational and infant welfare facilities. An Unemployment Assistance Fund will be founded to which local authorities will be required to contribute for a five-year period.

The bill has resulted in much controversy in Parliament. The Labor party has voiced the greatest opposition to the Government's plan, an opposition which is based primarily on the failure of the bill to restore the "cut" in benefit which was enacted in 1931, and the retention of the Means Tests. Members of this party believe that the division of the unemployed, "as distinct from unemployable," into two categories is most unfair. They assert that those who have allowed their insurance to lapse have done so through no fault of their own and should, therefore, be maintained by the State until returned to employment. The British Government, however, stands firm in its conviction that some distinction must be made between the two classes of unemployed in order to prevent them from becoming contented with their enforced idleness. Such a contentment is inevitable if such a class find it possible to obtain necessary finances without working. The Government also believes that to pay all unemployed persons at the same rate would prove too expensive a course for the State to pursue. The dual system of insurance and relief must be maintained as well as the Means Tests. By the latter system, which was put into operation in 1931 during the financial crisis of that year, the amount of relief is determined by the income of other members of the family of the one seeking relief. The Means Tests have never been popular and the Labor Party has sought to abolish it since its inception. Public opinion supports this aim of the Laborites.

Labor Party opposition is also extended to the compulsory educational centers which the Government proposes to institute. It is not to be inferred, however, that this opposition is based upon actual objection to furthering the educational opportunities of the unemployed. The opposition is rather based upon a fear that such compulsory instruction centers will increase the power of the Government to such an extent that it will "establish concentration camps to which it can send anyone with whose political opinions it does not agree." Should the Government contemplate any such action it would be ensured of defeat at the next general election. Thus the fear of the Labor Party is absolutely unfounded.

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London Hunger March

A huge crowd of more than 10,000 hunger marchers and unemployed staged a demonstration in Trafalgar Square, London, recently as a protest against the Government's unemployment policies. Tomm Mann, veteran British Communist leader, addressed the throng.

It has been proposed that the bill be amended in such a way as to increase the allowances made for children. Under the bill as it exists today, unmodified, an allowance of two shillings is made for each dependent child. The Government has left the final decision, as to whether this amount is sufficient to feed and clothe a child, up to the committees now considering the bill in the House of Commons.

The Government in drafting this plan of social legislation recognized the importance of measuring relief by actual need. It aimed primarily at preventing relief from becoming a mere dole. The Unemployment Bill has been acclaimed by Sir Henry Betterton in the House of Commons as "the most comprehensive piece of social legislation presented in Parliament for a generation." Public opinion and sympathy in England rest with the unemployed. The National Government is cognizant of the fact that its success at the next election is largely dependent upon the actual administration of the Unemployment Bill after it has become law. A hunger march was recently organized in London for the purpose of exhibiting disapproval of the Unemployment Bill and the Means Tests. The demonstration caused little disturbance. Registered unemployment has decreased about 500,000 since February, 1933.

Disarmament. The subject of disarmament has been an important topic in the Parliamentary sessions during the year 1934. On February 1, the British Government announced its British Draft Memorandum as an effective scheme which would meet the demands of Germany for "defensive equality" and at the same time provide "a general European system of security." Captain Anthony Eden, the Lord Privy Seal, was sent to Paris, Berlin and Rome to explain the draft to European officials and to urge its acceptance by these powers. On February 6, Sir John Simon in his discussion of the subject said, "Approaching the whole thing in a spirit of realism, we reach the inevitable deduction from two propositions, neither of which can be effectively challenged. The first proposition is that Germany's claim to equality of rights in the matter of armaments cannot be resisted and ought not to be resisted. Secondly, no practical solution can be found on the basis that all nations throughout the world immediately abandon all weapons denied to Germany by the Treaty of Versailles. The conclusion is that in a new convention you will have to face some rearmament by Germany." Great Britain has suggested an arms agreement which would be based on equality and a measure of rearmament in Germany, together with disarmament in other sections. Sir John Simon advocates an army of 200,000 men for Germany while Benito Mussolini of Italy favors an army of 300,000. Both Italy and England agree, however, that Germany must rejoin the Disarmament Conference and the League of Nations.

On February 7, a motion for rearmament was rejected. "Disarmament and peace are essential to the plans of the present government," since a failure on its part to effect any kind of an agreement on European disarmament would only serve to give strength to the National Government's opposition and bring about a change in its Ministry as well as its policy.

History. Cæsar's raid into Britannia, in 55 B. C., was followed by the Roman conquest; but the history of Great Britain does not properly begin till the fifth century when the Teutonic tribes which have given the nation its name gained a foothold on the island. Before 600 A. D., Saxons and Angles had made settlements as far north as the Forth, and the many princedoms had merged into the two rival powers, Northumbria and Kent, while a third, destined to devour the other two, was Wessex to the south. Long before Great Britain became one nation, its people were united by belonging to a single Christian church. The marriage of the king of Kent with a Frankish princess gave an opportunity for Augustine and his fellow-missionaries to land in 596; and the marriage of a Kentish princess with Edwin of Northumbria carried Christianity from Canterbury to York. In 802 Egbert, who had learned at the court of Charlemagne how to conquer, became king of Wessex, and brought all England under his power as far north as the Dee. The Danes, as robbers, then as settlers, and lastly as conquerors, harried the Saxons for 200 years after the death of Egbert. Alfred, by surrendering the north and east of England to be held as vassals of the Saxon king, secured the supremacy of Wessex. The reign of Edgar the Peaceful and the government of his great minister, Dunstan, closed the period of Saxon greatness. By 1012 the Danes had triumphed, and Sweyn, the leader of the invaders, was in fact King of England. Under his son, Canute. England was in some respects the head of a Scandinavian empire. But his two sons were weak, and with the aid of Godwin, the powerful earl of Wessex, Edward the Confessor re-established the Saxon line. On the death of Edward, Godwin's son Harold was recognized as the ablest man in the kingdom, and was chosen king. His banished brother, Tostig, was defeated at Stamford Bridge, but three days later Harold was himself defeated and slain in the battle of Senlac, near Hastings, by William the Conqueror, Oct. 14, 1066. With William began England's connection with the continent and the bringing in of feudalism. The Norman kings, when their time was not taken up by foreign wars, were occupied by strengthening against the nobles and the church the powerful monarchy founded by William.

Though the enormous power wielded by the Norman line was of great use to the nation in checking the barons, who were the oppressors of the serfs, its evils were seen when it came into the hands of boastful, tyrannical and weak King John. Disgraced in the eyes of all England by his allowing himself to be stripped of all his French possessions and by being excommunicated and deposed by the pope, the nobility appeared as the true leaders of the nation and wrung from the humbled king that great charter which secured the foundations of the future liberty of England. To make the charter a reality and secure the orderly growth of these liberties was the work of the great King Edward I. The attempt of Henry III to disregard *Magna Charta* caused the successful rebellion headed by Simon de Montfort. But in the reign of Edward I a parliament assembled (1295), and the principle that where all were concerned all should have a voice was acknowledged. Great powers were left to the king, but Parliament was armed with the right to tax, and steadily increased its grip on affairs till, at the close of Edward III's reign, it could impeach the ministry. Richard II's unwise claim to the sole power of the crown brought on the revolution that closed the struggle, and Henry IV came to the throne as the choice of Parliament, while the council named by Parliament became, in fact, a body of national ministers. Edward I died before he had finished the conquest of Scotland, and his weaker son, Edward II, had been badly defeated by the Scots at Bannockburn. Edward III's attempts to make himself king of France were mere raids of no lasting value, except so far as the life of the peasant-soldier helped to free the lower orders from serfdom. The French wars of Henry V were much more successful than those of Edward III, and the union of the two kingdoms seemed to be promised when the great king died. The manhood of Henry VI ushered in the Wars of the Roses between the two branches of the Plantagenets, the houses of Lancaster and York. The Yorkists won, and the powerful and despotic Edward IV ruled with a strong hand, and Parliament in his reign had little power. But his successor, Richard III, made himself hated by all classes of the people, and the battle of Bosworth put on the throne Henry VII, the first of the Tudors, who acknowledged that he was king by the will of the people. In Henry VIII determination to have his own will was blended with a real desire for the well-being of his people. Driven by his passion for Anne Boleyn, Henry demanded a divorce from his Spanish wife, and the opposition of the pope brought to a crisis in England the Reformation, which had been smouldering since the days of Wiclif. But Henry's zeal as a reformer overshot the mark, and it was with a general feeling in her favor that Mary, the champion of the old faith, ascended the throne. Unfortunately, she allied herself too closely to Spain, and it seemed likely that England might become a Spanish dependency. So when Elizabeth came to the throne, Prostestantism and national independence were linked together as one cause; and she, as well as Mary, was at first supported by the bulk of the nation. Her great minister, Lord William Cecil, played such an able part that, without openly defying the great Catholic powers, she came to be looked to at home and abroad as the champion of Protestantism; and the strength of the nation was built up till it could drive from the coasts of England the Spanish Armada.

On the death of the queen the crown passed to the Scottish king. James I came to the throne more by right of inheritance than by choice of Parliament. His title was declared to be by divine right, as it was then called, but he was used to Scotch, not to English, ideas of the rights of the crown. The rights of Parliament had been decided when the house of Lancaster was on the throne, but now had to be fought for all over with the house of Stuart. The struggle came to a head under Charles I, from whom was forced the great Petition of Rights. Then followed the Civil War and the trial and execution of Charles. But Parliament now found itself mastered by the overwhelming ability of Oliver Cromwell, who had been brought to the front as a successful general in the war. He succeeded in raising England to a high place among nations, but on his death and the prospect of a succession of military tyrannies Charles II was asked to be king. At once the struggle between king and Parliament began again; and, though Charles died seemingly triumphant, the want of judgment, little short of blindness, of his brother, James II, in a few years brought things to a head. Invited by the leaders of the Whig party, William of Orange had but to lead to put an end to the Stuart dynasty and drive James from the country. William was the first parliamentary king; for before power was put in his hands a binding charter set forth the liberties of the country. When the last attempt of the Stuarts to regain the throne was thwarted in 1715, Parliament settled the Hanoverian house upon the throne, and since that time through the reigns of the four Georges, William IV and Victoria, England has had what is called a constitutional government. It was in the reign of Anne that party-government began. Marlborough did not have complete success in his wars till he found himself supported in 1708 by a ministry all of one party. From that time the ministry, really a committee of the majority of the house of commons and known as the cabinet, has formed a part of the machinery of government. Under Elizabeth England had become a world-power, but not till the Revolution of 1688 did it become a power of the first rank in Europe. Then, under William and Marlborough, England forced its way to the head of the European nations in the wars against Louis XIV. Under the great Chatham her navy was supreme upon the ocean, and under his greater son, Pitt, English money, English troops and English successes in Spain were the great causes of Napoleon's downfall. In the nineteenth century the wars the nation fought were avowedly in the interests of her colonies, while she kept more aloof from the politics of the continent. The most marked thing in the history of the nineteenth century was the rise into greater prominence of the trading, manufacturing and laboring classes, who were given representation in Parliament by the great reform-bill of 1832. Since that time Great Britain has been slowly but surely growing into a real democracy. With the decease (May 6, 1910) of King Edward VII, George V succeeded to the throne.

The part played by Great Britain in the World War, which came in the fourth year of King George's reign, and its vast importance in determining the result, is fully dealt with in the article on that subject. The greatness of Great Britain's achievement is further enhanced when the difficulties under which she was laboring at the time she entered the conflict are considered; Ireland on the verge of civil war, the army far below its proper standard, the mother country in dispute with her colonies over the question of shipbuilding—to mention only some of the more conspicuous.

Yet, by April following the invasion of Belgium in 1914, three-quarters of a million men, responding to Lord Kitchener's appeal, had been safely transported across the Channel in spite of the submarines, and Lord Derby's recruiting campaign in the three concluding months of the same year placed over 800,000 more in the ranks of the voluteeers.

Then came conscription, the taking over by the government of all factories capable of producing munitions of war, the formation of a coalition cabinet, with Lloyd George as minister of munitions. Lloyd George later became prime minister and was the greatest force in bringing the war to a successful conclusion.

Since the beginning of 1931, Great Britain has been on the verge of financial disaster, but like many another nation has successfully muddled through this distressing period and has at last started on the up-grade. During the past year business has shown a renewed activity. Like other European nations, however, Great Britain has its element of Fascism to contend with, its reactionary factions, which, stirred on by the successes of their European neighbors, have issued demands for many reforms. One of the most important of these demands calls for a reconstruction of the Cabinet. Great Britain has had four Fascist organizations since 1923, the British Fascists, Ltd., organized by Miss Lintorn-Orman; the National Fascists, founded in 1928; the Imperial Fascist League, formed by Arnold Leese, and the British Union of Fascists, the founder of which is the distinguished Sir Oswald Mosely, former Chancellor of the Duchy of Lancaster (1929-30). Sir Oswald's party is a nationalist one, a party that is primarily interested in Great Britain, in developing its home markets, increasing its wages, destroying its slums and generally improving living and working conditions in the country. Its program is stoutly opposed to chauvinism. Sir Oswald has as yet been unable to convince the British public of the soundness of his principles, rather he has alarmed the people. The London headquarters of the British Union of Fascists are situated in an abandoned theological college in Chelsea. It can not be denied that Sir Oswald is a forceful character and a dynamic leader, but his actions have thus far warranted only criticism. The most important disturbance which the Fascists have caused in British society and which brought them into conflict with British law, was their support of the Sussex landholders who refused to pay the customary "tithes" to the church. Various reports circled about London to the effect that Sir John Simon, Foreign Secretary, was to be transferred to the Home Office so that he might deal effectively with the British Union of Fascists. Several rumors have persisted that Cabinet changes were contemplated, but these rumors have not been substantiated.

The Labor party recently gained more than sixty of the 124 seats on the London County Council which has control of housing, education, fire fighting, poor relief, and minor activities in the Greater London district. Labor leaders look upon their victory as an indication of the triumph of the Labor party which will result at the coming general elections. London may now be termed a Socialistic municipality, the victory of the Laborites having "roughly banished a complaisant belief in the enduring conservatism of the metropolis." The Conservatives (Municipal Reformers) gained but thirty-seven seats in the election while the Liberals gained none. An unusual item of the election was that only 35.6 per cent of the electorate bothered to go to the polls and cast their vote. The victory of the Laborites is an indication of the strong demand for a change of policy in government as well as of the improved party organization of the Labor group.

The most important industries of Great Britain, coal, cotton, iron and steel, have shown signs of a steady decrease since the close of the World War. A consequent unemployment problem has confronted the British Government which has indeed been a formidable one and the main issue in government affairs.

Mr. Chamberlain said, "We can not increase our trade with other countries without ourselves buying more from them. It is no good bowing down before the 'wave of economic nationalism which seems to be sweeping over the world'—rather, we must break it down by buying from other countries and making it desirable for them to purchase from us."

Great Eastern. This immense vessel, once the largest ever built, was planned in 1852 for the Eastern Steam Navigation company. A vessel was wanted to sail to Australia round the Cape of Good Hope, which could carry coal enough for the voyage—out and home—and have space besides for passengers and cargo. The idea was to accommodate 1,000 passengers, 5,000 tons of cargo and 15,000 tons of coal. Her eight engines were estimated to work up to 11,000 horsepower. She carried six masts, five of them of iron. The vast, wall-sided compartments of the ship, it was designed, could be changed into cabins for 800 salon passengers; 2,000 second class; 1,200 third-class; and 400 officers and crew; or 5,000 could be carried, if all emigrants or troops. The plans for this mighty vessel were never fully carried out in all their details, owing to numerous refittings and alterations. The directors decided on a trial trip across the Atlantic. It was a disaster. The *Great Eastern* left the Thames on Sept. 8, 1859. An explosion of steampipes took place off Hastings, seven persons were killed and several wounded, and the voyage came to an end at Portland. She started again, June 17, 1860, from Southampton, and crossed to New York in eleven days. She made many trips, losing money, as the expenses and repairs came to more than the receipts. She "paid out" the Atlantic cable, and successfully laid some others of the most important ones across the Atlantic, in the Mediterranean, Red Sea, etc. She was used as a coal-hulk at Gibraltar in 1884. At last, after being utilized as a "show," she was sold by auction in Liverpool to be broken up.

Great Falls, a city and the seat of Cascade County, is situated on the Missouri River, in western-central Montana, about seventy-five miles northeast of Helena. The Great Northern Railroad enters the city, as does the Great Falls line which connects it with the Canadian town of Lethbridge in Alberta. In the region are rich mines of copper, lead, iron, coal and building-stone, together with silver and gold. The town's motive power is derived from an immense dam at Black Eagle Falls. Its chief manufactures are flour, furniture, mining and agricultural implements, carriages and woolen goods. The notable falls, Rainbow and Great Falls are situated here. In 1930 the population was 28,822.

Great Kanawha (*kȧ-nạ'wȧ*) **River**, a tributary of the Ohio, rises in the Blue Ridge of North Carolina, and is called New River for part of its course. It is navigable for about 100 miles, and is 450 miles in length.

Great Powers of Europe, The. This term properly dates from the Congress of Vienna, which met September, 1814, was interrupted by Napoleon's return and his last campaign, and was finally dissolved on June 9, 1815, before that campaign ended in the battle of Waterloo. The Great Powers were Austria, France, Great Britain, Prussia and Russia. Prior to this, the combinations of the Powers were in the form of coalitions against the great force of France, but thenceforward France entered the circle on equal terms with the rest. The Congress of Vienna reëstablished the monarchies of Prussia and Austria which Napoleon had overthrown, and otherwise settled the affairs of European nations. The monarchs of these Great Powers then formed the Holy Alliance, England alone abstaining, which for many years was successful in preventing the growth of republican institutions throughout Europe, and was in large measure the unwilling cause of the liberation of South American countries from Spain and Portugal. It crushed popular movements in Spain, Italy and Greece. But in 1827 all the Powers joined in giving Greece its freedom from Turkey and in making it an independent kingdom by the treaty of London. The same Powers in 1831 recognized the independence of Belgium from Holland. Against the wishes of France the remaining four Powers saved Turkey from the invading forces of Mehemet Ali, viceroy of Egypt (1841). The Powers were once more divided by the desire of Russia to partition among the Powers the Turkish domain in Europe. There resulted the Crimean War (1854), in which France and England, together with Sardinia, went to the rescue of Turkey. The Powers met again at the Peace of Paris (1856), when the Black Sea was closed to vessels of war and the integrity of the Turkish empire guaranteed. Again, the Powers were divided when France assisted Italy in its successful effort to gain freedom from Austria. Italy became an independent kingdom in 1866. The Austro-Prussian, the Franco-German and the Russo-Turkish war were followed by the Congress at Berlin, June 13-July 13, 1878. These concerted actions were to prevent war and to adjust the results of war. The latter purpose was based on the theory that any increase of power, territory or population by any one power entitled all the others to compensation (v. MOROCCO) so that the relative strength of each might not be affected. Hence, after every important European war since Napoleon, the Great Powers have taken part in determining the terms of peace. The "balance of power" idea was one of the causes of the European War since Austria's attack on Servia was interpreted as an attempt to further extend her power and territory in the Balkans.

Great Salt Lake in Utah, is over 80 miles long and from 20 to 32 wide, and is the outlet of the Bear, Ogden, Jordan and Weber Rivers. It lies at the base of the Wasatch Mountains, 4,200 feet above the sea level, and is very shallow. It has no outlet, except by evaporation of its waters, and contains a large quantity of salt—about 15 per cent.—in which no fishes thrive. Great Salt Lake or, as it has been called, Lake Bonneville was first mentioned by a Franciscan friar, Escalanta, in 1776, but was not explored until 1843, by Frémont. There are well-marked shore lines on the mountains around, reaching 1,000 feet higher than the present level, which show that the lake was once vastly larger. See H. H. Bancroft's *Utah*.

Great Slave Lake, in the southern part of the District of Mackenzie, Canada, is an immense inland sea (area 11,821 square miles). It is navigable throughout its whole length and breadth. At its western end the Mackenzie River which flows into the Arctic Ocean (one of the eight largest rivers in the world) has its starting point. The southern shore of the lake has good agricultural prospects.

Great Slave River, in the province of Alberta (Canada), is 300 miles long, flows into Great Slave Lake, and is noted for its abundance of fish.

Great Sodus. A settlement in Wayne County, New York, on the southern shore of Lake Ontario, where a large quantity of American military stores was seized by Canadian and British forces on June 19, 1813.

Grebe (*grēb*), a kind of waterbird, is peculiar for its semi-webbed feet and legs set very far back in such a way as to be better adapted for swimming than for walking on shore. There are more than 20 species, one or another of which is to be found in any quarter of the high seas. The downy feathers of grebes are in demand for ladies' muffs and other articles of winter dress. In America grebes are often popularly called hell-divers. The horned grebe, to be recognised by a ruff of rusty-black feathers upon the head, is common both to America and Europe. The European variety, known as the great crested grebe, grows to a length of over two feet.

Greece is the most easterly of the three southern peninsulas of Europe, extending into the Mediterranean. Its states or provinces are divided from each other by its mountain ranges and peaks, which have associated with them many very interesting and entertaining stories. The range on the north, which separates Greece from the continent of Europe, is a continuation of the Balkans. From this several chains extend in a somewhat southerly direction, dividing Macedonia from Illyria and Epirus from Thessaly. The eastern boundary is marked by the sea and mountains from the Balkan system, among them being Olympus, 9,750 feet high (upon which were supposed to dwell the gods of ancient mythology), Ossa, Mavro, Vuni and Pelion. That part of the range which marks the eastern boundary of Thessaly extends beyond the mainland and forms the islands of Eubœa, Andros, Tinos, Mykonos, Naxia, and Amurgos. The "island" of Pelops, called the Peloponnesus but bearing the modern name of the Morea, is connected with the mainland by the narrow Isthmus of Corinth. The islands have mountain systems of their own, among the higher peaks being Aroania (7,724 feet) and Taygetus (7,904 feet).

Transportation. The rivers, from the size and nature of the country, are of little importance, and flow generally south or west. The largest are the Aous, Achelous, Peneus and Haliacmon. In October, 1903, the canal (four miles in length) across the Isthmus of Corinth was opened for traffic

In 1904 there were 700 miles of railway in operation, besides 4,000 miles of telegraph lines.

Products. Its chief products are currants, wine, oil and olives, besides minerals and agricultural products. Sponge-fishing also is an important industry.

Government and Cities. Greece became a republic in 1924. Ex-premier Venizelos, who had organized a rebellion against King Constantine to bring Greece into the World War on the side of the Allies, became the first premier of the republic. The area of Greece and dependencies is 25,014 square miles, with a population of 6,500,000. The chief cities are Athens (the capital) with Piraeus, 350,000; Patras, 40,000; Corfu, 145,000.

People. The ancient Greeks were a branch of the family that includes most Europeans, coming from what were styled Indo-European or Aryan peoples. They were not a grand division of the human race, except as regards language. It is doubtful whether the home of the original people was in Europe or in Asia, but there is hardly any question that the first Greek tribes were wanderers, living on their flocks, who entered Greece over the mountains of the north; and, as each succeeding tribe followed, the preceding ones were pushed further southward, until not only was the mainland occupied, but Greek settlements filled Sicily and the Mediterranean islands and dotted Asia Minor. These Greeks called themselves *Hellenes*, were called *Græci* and *Ionians* by the Italians and Orientals in turn, while Homer speaks of them as *Danaans* and *Achæans.* It has been said that there are no Greeks in Greece, but it is pretty certain that the modern inhabitants are descendants of the three races — Greeks, Thracians and Illyrians — that lived at the time of the Roman conquest. The language of the Greeks was closely allied to Sanskrit, and was spoken in seven dialects, at least to the end of the second century, but later modifications and changes were made which left the language in its present form.

Religion. When we first have any account of the ancient Greek religion, we learn that they followed a kind of idolatrous worship of many gods, each supposed to control a different branch of human destiny and endowed with varying attributes and powers. The worship was by prayers, offerings and sacrifices. This was mythology. The modern Greek church is called the Orthodox church, and is endowed and supported by the state and subject to it in all but spiritual matters.

History. The earliest history of Greece which can be mentioned with any certainty begins with the Dorian invasion, which, covering about two centuries, was completed about 1000 B. C. This invasion caused the people then in Epirus to move to Thessaly, the Thessalians to emigrate to Bœotia, while the Doric invaders formed the state of Sparta. The effect of this invasion was to cause the former inhabitants to be reduced to slavery not only in the mainland but in the colonies, and tyranny was rife. Sparta, on account of the small number of its people, became a military state, more as a matter of self-protection at first, but afterward grew into a predatory state. In 431 B. C. the great war between Sparta and Athens began, and it lasted for 27 years before Athens was defeated. The supremacy of Sparta being thus established, it set about a series of oppressions and tyrannies, so that a combination of the other states, aided by the Persian king, caused its downfall and defeat at Leuctra in 370. Greece attained its greatest power under the great Alexander, the son of Philip of Macedon, who defeated Darius, founded Alexandria, overthrew the Persian empire and gained Asia Minor, everywhere planting Greek colonies. He died at Babylon in 323 B. C. Upon his death ensued the Lamian War for political liberty, but the Macedonians, under Antipater, were again victorious. In 395 A. D. Greece was ravaged by the Goths, and in 747 a great pestilence depopulated many parts of the country. In 1018 the Bulgarians swept the country, but were finally defeated by Basil II. Mohammed II made himself master of Greece in 1453, and almost all the possessions of Greece gradually passed into the hands of the Turks before 1669. Thus it remained until, in 1821, the war for independence broke out and lasted until, by the aid of England, France and Russia, Greece once more regained her liberty in 1830. In 1833 Otho of Bavaria was made king, but had to leave the country in 1862. Then came, in order, George I. (*q. v.*), Constantine I., Alexander, second son of Constantine (*q. v.*), who, on Alexander's death was recalled to the throne. See Schrader's *Prehistoric Antiquities* (translated by F. B. Jevon); *History*, by Thirlwall, Grote, Curtius and Findlay; and Jevon's *Greek Literature.*

Greek Literature. See LITERATURE.

Gree'ley (*grē'lĭ*), **Horace,** was born at Amherst, N. H., Feb. 3, 1811. After obtaining a common-school education, he entered a printing-office at East Poultney, Vt., and there rose to the position of assistant-editor on the *Northern Spectator.* He then worked as a journeyman-printer, reaching New York in 1831 with ten dollars in his pocket; and there, with a fellow-workman, he

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founded the *New Yorker,* a weekly, in 1834. His first success was the *Log-Cabin,* a campaign paper which aided largely to bring about the election of Gen. W. H. Harrison to the presidency in 1840. On April 10, 1841, he issued the first number of the New York *Tribune,* an advocate of temperance, co-operation, a protective tariff and the abolition of slavery and capital punishment. It at first was Whig, then antislavery Whig and subsequently the most powerful organ of the Republican party. This paper he edited until his death. In 1848 he was elected to Congress. When the southern states seceded, he at first upheld their course as being in accordance with the Declaration of Independence; but when the war began, he became its earnest supporter. At the close of the war he was a strenuous advocate of amnesty for all, and went to Richmond to offer bail for Jefferson Davis, for which action he was strongly condemned. In 1872 he was a candidate for president against General Grant, and met with defeat. This broke his health and spirit, and he died on November 29, 1872. Greeley was a good and popular speaker and one of America's greatest editors. Greeley, Colorado, was named in his honor. Among his works are included: *The American Conflict* (1864-66); *Recollections of a Busy Life* (1868); *Essays on Political Economy* (1870); and *What I Know of Farming* (1871).

Greely, Adolphus Washington, an American Arctic explorer, was born at Newburyport, Massachusetts, on March 27, 1844. He served through the Civil War, and shortly afterward entered the regular army as lieutenant. In 1868 Greely was assigned to the signal service, remaining until 1881, when he was selected to lead the expedition to the head of Smith Sound. After terrible sufferings in the Arctic regions for three years, he and the survivors of his party were rescued in 1883. He was appointed chief of the signal service, and gazetted brigadier-general in 1887. He installed 107 miles of wireless section between Nome and St. Michael in Alaska in 1900-1904. Under his direction more than 20,000 miles of telegraph wire were installed in Cuba, Puerto Rico, and the Philippines. His works include *Reminiscences of Travel and Adventure* (1927); and *Polar Regions in the Twentieth Century* (1928).

Green, John Richard, a distinguished English historian, was born at Oxford, in December, 1837. He was educated at Oxford University. His first work was a series of papers on *Oxford in the Last Century* in the Oxford *Chronicle.* He then entered the ministry, became a curate and then vicar, all the time contributing to the London *Saturday Review.* When he became librarian at Lambeth Palace in 1868, he was stricken with consumption, yet he did not stop writing, although his condition prevented any active labor. In 1874 his *Short History of the English People* became popular at once, and reached a sale of 150,000 copies. Creighton, himself a great historian, declared that Green had done for all English history what Macaulay had done only for a period; he had unified it. Later he brought out a larger edition of the work, the well-known *History of the English People.* He worked steadily on, struggling with hopeless disease, bringing out his *Making of England* the year before he died, and leaving his *Conquest of England* to be edited by his widow. He died at Mentone, on March 7, 1883.

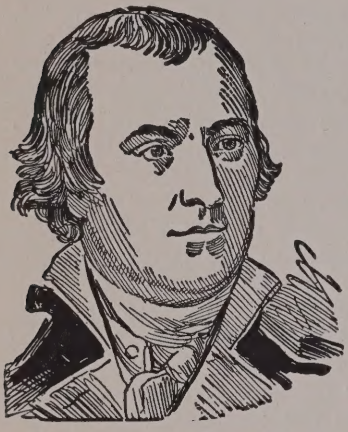
Green, Seth, an American pisciculturist, was born at Rochester, New York, on March 19, 1817. He received a common-school education, but early gave all his time to hunting and fishing. He invented the method of protecting the spawn of the salmon, and in 1867 hatched 15,000,000 shad at Holyoke, hatching to the Hudson, Potomac and Susquehanna rivers. To him, more than to any other American pisciculturist, is due the great advance in late years in fish culture in the New World. He became superintendent of the New York State fisheries. He died at Rochester, New York, on August 20, 1888.

Green, William, an American labor leader, was born at Coshocton, Ohio, on March 3, 1873. He was educated in the public schools. At an early age he became a miner. From 1900 to 1906 he was president of the United Mine Workers of America. In the latter year he became president of the Ohio district Mine Workers Union, and served in that capacity until 1910. He was then elected to the Ohio Senate and served two terms in that legislative body. In 1912 he served as delegate at large from Ohio to the Democratic Convention at Baltimore. In the following year he became International Secretary-Treasurer of the United Mine Workers of America and occupied that position until 1925. In 1924 Green was elected president of the American Federation of Labor, succeeding the "Grand Old Man" of that organization, Samuel F. Gompers. William Green has been re-elected annually to that office. In 1930 he was awarded the Roosevelt Medal for distinguished service in the promotion of industrial peace. He was also made a member of the American Academy of Political and Social Science. Green is the author of the Ohio Workmen's Compensation Law.

Green Bay, a city and the seat of Brown County, Wisconsin, is situated on the Fox River at the entrance to Green Bay. It is about 112 miles north of Milwaukee. Green Bay is the oldest town in the State, having been first visited in 1634 by Jean Nicollet and thereafter settled by the French. Fort Howard, established in 1816, was annexed in 1895.

Green Bay is an important railway center, and is connected by interurban line with Oshkosh and Fond du Lac. An excellent harbor provides access for the largest vessels upon the Great Lakes, while a line of pleasure boats runs to Mackinac and the "Soo." The principal industries include the manufacture of garments, soap, flour, canned products, and lumber. The city was first settled in 1745. In 1930 the population was 37,415.

Greene, Nathaniel, an American general, was born at Warwick, Rhode Island, on June 6, 1742, the son of a Quaker preacher. In 1770 he became a member of the Rhode Island assembly, and in 1774, in spite of his religion, enlisted as a private, and was the next year given command of the Rhode Island forces around Boston as brigadier-general. The next year he was made major-general, and distinguished himself at Trenton and at Princeton. He was in command of a division at Brandywine, where he saved the American army from destruction. In 1778 he was made quartermaster-general, retaining the right to fight on the field. In 1780 he defeated Clinton at Rahway, was president of the board that condemned André, resigned as quartermaster and succeeded Arnold at West Point. When Greene succeeded Gates in command of the Army of the South in 1780, he found the army in so wretched a state, without discipline, arms or clothing, that he could not bring it into a condition for fighting until 1781. Then he entered South Carolina and Georgia, carrying everything before him. For this he was awarded a medal by Congress and large grants of land by South Carolina and Georgia. He died of sunstroke at Mulberry Grove, Georgia, on June 19, 1786. Greene was one of the ablest generals of the Revolution, second, perhaps, only to Washington, whose close friend he was.



NATHANIEL GREENE

Greenland, an immense island in the Arctic, 900 miles wide by 1,600 miles long. No traces are left of two settlements made in Greenland in 986. They were probably destroyed by the Eskimos some time after 1340, and in 1448 all communication with Europe ceased. John Davis re-discovered Greenland in 1585 and the Danish settled it in 1721. The area of the Danish colony is 46,740 square miles. The total area is 827,300 square miles.

The people live mainly on seals and whales, killing about 100,000 annually. Fish sharks are also eaten. The dogs used to draw sledges, are of much importance. Over 25,000 reindeer were shot yearly between 1845 and 1849, but they are now scarce.

The country is mountainous, barren and covered with a glacier sheet averaging 1,000 feet in thickness and rising into ice caps 10,000 feet high. Under pressure of its own weight enormous glaciers flow out from this ice cap, sometimes at the rate of 50 ft. in a day through the fjords which deeply indent the coast where they break off into the icebergs that peril navigation. The larger ice fjords each receive in a year enough ice to make a mountain more than 1,000 feet high and covering four sq. miles. Peary in 1892 and 1895 crossed Northern Greenland and rounded its northern extremity in 1900.

So far as known Greenland is the coldest inhabited country in the world. It is the only known home of the iceberg in the northern hemisphere. It is estimated that if all the ice in Greenland were spread over the United States it would make a covering a quarter of a mile thick.

Greenland exports eiderdown, game and fish. American ships fish halibut off the west coast, but the trade of Greenland is a State monopoly. In 1931, Greenland exported to Denmark goods to the value of 5,747,000 kroner.

The population, in 1931, was 16,819, chiefly Eskimo. It is estimated that there are about 324 European inhabitants, most of whom have Eskimo wives.

Greenlet. See VIREO.

Green Mountains, covering a part of Vermont, are the northernmost extension of the Appalachian Range, extending in a southwesterly direction. They run in nearly parallel lines, with almost flat tops, and nowhere reach the snow-line. Among the main peaks are Mansfield, 4,393 feet; Camel's Hump, 4,188 feet; and Killington, 4,241 feet.

Greenock, a seaport of Renfrewshire, Scotland, is situated on the south shore of the Firth of Clyde. It is beautifully located, lying for more than four miles along the coast, backed by abruptly rising cliffs looking out over its excellent harbor. Its beautiful public buildings, among them the city hall with a tower 245 feet in height, win the admiration of all visitors to the burgh. The principal industry is shipbuilding. Other important industries include sugar-refining, the manufacture of steam engines, anchors, chain cables, ropes, sailcloth, paper, wool and worsted.

The city has the reputation of being always wet, the rainfall being sixty inches a year. It is the birthplace of Watt. The grave of Burns' "Highland Mary" is also situated in Greenock.

In 1931 the population was 78,948.

Greenough (*grēn'ō*), **Horatio**, an American sculptor, was born at Boston, on September 6, 1805. He studied for two years at Harvard, but after 1825 lived at Rome. His principal work is the large statue of Washington, now in front of the national capitol. His other important works are *Medora; Venus Victrix* and a group of four, called *The Rescue.* He died suddenly at Somerville, Massachusetts, on December 18, 1852.

Greensboro (*grēnz'bŭr-ō*), a city and the seat of Guilford County, is situated in northwestern North Carolina, about eighty miles west by north of Raleigh, on the Cape

Fear and Yadkin Valley and the Southern railroad. Considerable tobacco, corn, wheat, oats and fruit are raised in the vicinity, and there are some copper, iron and even gold found in the region. It also has blast furnaces for the manufacture of Bessemer steel, and has a number of brick, tile, terracotta and casting manufactories, cotton mills and several agricultural machine shops. It is the seat of the State Normal and Industrial College, Guilford College, Bennett College for colored youth and Greensboro College for girls. Population 25,000

Green′ville, S. C., the capital of Greenville County, northwestern South Carolina, on the Reedy River and near the region of the Blue Ridge Mountains, which give it a desirable and pleasant location. It is the seat of Furman University, Greenville Female College and a theological school, all under Baptist direction, besides a military institute, a business college and Chicora Female College (Presbyterian). It has considerable manufactures, including cotton-mills, wagon and carriage factories, flour-mills, iron-works, etc. Population 27,000

Greenville, Texas, county-seat of Hunt County, 51 miles northeast of Dallas. It is the tradecenter for an agricultural and stockraising region. Its industries comprise flour and cotton-seed oil mills, cotton compresses, stock-yards and machine-shops. It has good schools, and is the seat of Burleson College (Baptist). The city owns and operates the electric light plant, and has the service of three railroads. Population 16,000

Green′way, Thomas, was born in Cornwall, England, in 1838. Settled when young in Huron County, Ontario; and was elected to the House of Commons, Ottawa, in 1875. Going to Manitoba in 1878, he was elected to the legislature in 1879, became Premier in 1888, and again was elected to the House of Commons in 1904.

Green′wich (*grĕn′ĭj*), a city of Kent, England, and a suburb of London, is situated on the south side of the Thames, about five miles from London Bridge. It is chiefly notable for its public buildings, first among them being Greenwich Hospital, for the maintenance of British sailors. It consists of four parts, built successively by King Charles, King William, Queen Mary and Queen Anne. Its first pensioners were received in 1705, and in 1814 they numbered 2,710. Among other institutions Greenwich has a naval museum, the Royal Hospital School, established in 1712, and the Royal observatory built by Charles II in 1675. Greenwich is the place from which geographers reckon longitude. It has a population of 185,149. See *The Palace and the Hospital* by A. G. L'Estrange.

Greenwich Observatory, situated in a 190-acre park in Greenwich, England, was built in 1675 for the advancement of navigation and nautical astronomy. From this observatory the exact time is telegraphed every day at one o'clock to over six hundred towns in England. It is one of the foremost observatories of the world as well as one of the oldest.

Greg′ory, the name of 16 popes.

Greg′ory I, Gregory the Great, was born at Rome about 540 A. D. He was at an early age made prætor of Rome by Emperor Justin II of Constantinople, but resigned this office and withdrew to one of the seven monasteries he had founded. "He lavished on the poor all his costly robes, his silk, his gold, his jewels, his furniture, and, not even assuming to himself the abbacy of his convent, but beginning with the lowest monastic duties, he devoted himself altogether to God." It was while here that he one day saw some fair-haired Anglo-Saxon youths in the slave-market. When he was told they were Angles, he said: "Not Angles, but angels," and was seized with a longing to Christianize their country. He set out, but was asked to return by Pope Benedict on account of the clamor over his departure. Pelagius II, Benedict's successor, sent Gregory to Constantinople as papal nuncio. He remained there for three years, writing his *Moralia*, and on his return to Rome was unanimously elected to succeed Pelagius, who had died of the plague. He was consecrated pope on Sept. 3, 590, and began an immediate reform in the organization and ritual of the Roman church, which is indebted to him for her complete ritual and chants. He also brought Britain and Spain within the pale of Christianity. He died on March 12, 604. See the Rev. J. Barmby's *Fathers for English Readers*.

Gregory VII, whose family name was Hildebrand, was born about 1020 at Soana in Tuscany, Italy. His youth was passed in the monastery of St. Maria at Rome, but his studies were finished in France at the monastery at Cluny. He became the chaplain of Gregory VI, and afterwards, in 1049, was made cardinal by Leo IX, exercising great influence and power under him and his successors. After the death of Alexander II he was unanimously elected and crowned pope, July 10, 1073. From the day of consecration he devoted himself to the abolition of the system of investiture, and declared that he would punish offenders. At one time he removed several bishops for this offense, but Henry IV sought to protect them, and issued an order declaring Gregory removed from office. Gregory responded by excommunicating Henry, who, forced by public clamor, was compelled to undergo a humiliating penance before the ban was removed. Thereupon, in 1080, Henry again declared Gregory deposed, and appointed Guibert, archbishop of Ravenna, pope as Clement III and took possession of Rome in 1084. Henry was then driven from Rome by Robert Guiscard, the duke of Apulia, but the city was left in so wretched a condition that Gregory finally had to withdraw to Salerno, where he died, May 25, 1085. His dying words were: "I have loved justice and hated iniquity; therefore I die in exile." See Milman's *Latin Christianity*.

Grenfell (*grĕn′fĕl*), **George,** African missionary and explorer, was born at Mount Bay, near Penzance, England, on Aug. 21, 1849. After study at the Bristol Baptist College he was sent to Kamerun by the Baptist Missionary Society in 1874 and to the Congo in 1876. He discovered Edra Falls in the Kamerun in 1876, the meeting of the Mobangi and Congo Rivers in 1884, and from 1884 to 1886 made a track-survey of 2,000 miles along previously unknown waterways of the upper Congo system, for which he received the gold medal of the Royal Geographical society. He was royal commissioner for the delimitation of the Lunda frontier between the Congo Free State and Portuguese West Africa and secretary of the commission for the protection of the natives of the Congo Free State. He died in 1906.

Grenfell, Wilfrid T. The first doctor to go to the fisherman. He has lived 12 years among them on the German Ocean and the Labrador coast. His name is inseparably connected with the Labrador Deep-Sea Mission. He first came to Labrador in 1892 in the mission-ship *Albert.* Through his instrumentality two well-equipped hospitals, one at Battle Harbor and one at Indian Harbor, have been erected. In them thousands of patients have been treated. Two yachts have been presented to him for mission-work. His heroism in braving the perils of that stormy coast in pursuit of his philanthropic work has won for him universal respect and admiration.

Gres′ham, Walter Quinton, American politician, was born near Lanesville, Ind., March 17, 1832, and died at Washington, D. C., May 28, 1895. Educated at Bloomington University, he was admitted to the bar, and in 1860 became member of the Indiana legislature. On the outbreak of the Civil War he retired from the legislature, and served gallantly with Sherman, was wounded at Atlanta, and retired with the brevet rank of major-general in the volunteers. From 1869 to 1882 he was United States judge for the district of Indiana, when he became postmaster-general under President Arthur, exchanging this post, on the death of Secretary Folger (Sept. 1884), for the secretaryship of the treasury. This, in the same year, he resigned to accept the office of United States judge for the 7th circuit, exchanging this post in 1893 to enter President Cleveland's cabinet as secretary of state.

Gret′na Green, a village in Dumfriesshire, Scotland, near the head of Solway Firth, made famous by the number of runaway marriages that used to be celebrated there. This was a great resort for that purpose as early as 1771, sometimes as many as 200 couples a year being married at the toll-house. In 1856 all marriages celebrated there were rendered invalid, unless one of the parties had resided for at least three weeks in Scotland.

Greuze (*grēz*), **Jean Baptiste,** a French painter, was born at Tournus, Aug. 21, 1725. He received instruction in art from Gromdon in Lyons, afterwards going to Paris to study at the Academy. *A Father explaining the Bible to His Children* created much comment, and his *Blind Man Cheated* admitted him to the Academy as an associate. Greuze now proceeded to Italy, exhibiting several Italian subjects on his return to Paris in 1757, but having failed to comply with the rules of the Academy he was barred from exhibiting there. In 1769 his *Severus reproaching Caracalla* caused his partial reinstatement, but he refused to accept it, and died in poverty at Paris, March 21, 1805. He is seen at his best in such fancy studies of girls as *The Broken Picture, Innocence* and *Girl With Doves.*

Gre′vy (*grā-vē′*), **François Paul Jules,** was born in Mont-sous-Vaudrey, France, Aug. 15, 1807. He studied law and was admitted to the bar in Paris, where he became prominent through his defense of republican political prisoners. After the revolution of 1848 he was returned to the assembly from his native department, and became prominent as a speaker. His debates on the constitution and his opposition to the government of Louis Napoleon marked his career, until he retired when the second empire was established. In 1869 he again became a deputy, and was elected president of the assembly in 1871, 1876, 1877 and 1879. In 1879, upon the resignation of McMahon, Grévy was elected president of the republic, but his term was not marked by any particular achievement. Reelected in 1885, he resigned on Dec. 2, 1887, living a retired life until his death, Sept. 9, 1891.

Grey, Albert Henry George, Fourth Earl, Viscount Howick of the County of Northumberland (England), was born 1851 and educated at Harrow and Trinity Col-

EARL GREY

lege, Cambridge. He was a member of the House of Commons from 1880 to 1885, was administrator of Rhodesia in 1896-7, and a Director of the British South Africa Company since 1898. The first Earl Grey was a general in the American Revolutionary war and the second was the celebrated Charles Earl Grey one of the distinguished statesmen of the early part of the last century. The present earl succeeded to the earldom in 1894, and in 1877 married Alice, daughter of Robert S. Holford, M. P. He has one son and two daughters. He was appointed Governor-General of Canada in September, 1904. The Duke of Connaught succeeded him in 1911.

Grey, Lady Jane, English queen for nine days, was born at Broadgate, England, in October, 1537. She was the oldest daughter of Henry Grey, afterward Duke of Suffolk, and Lady Frances Brandon, and was highly educated and accomplished. When but 16, she was married against her will to Lord Guildford Dudley, fourth son of the Duke of Northumberland, to secure the succession of the throne to Northumberland's family after the death of Edward VI, who was then very sick. On July 9, 1553, she was made queen, only three days after the death of Edward, but on the 19th she was taken a prisoner to the Tower, charged with treason, and four months later was sentenced to die. Her father's part in Wyatt's rebellion hastened her death, and she was beheaded on Tower Hill, London, on Feb. 12, 1554. In her speech from the scaffold, she "washed her hands" of any desire to be queen, and said: "I die a true Christian woman." See the *Chronicle of Queen Jane.*

Griffith, Arthur, Irish agitator, editor, statesman, was born in Dublin in 1872, and died August 12, 1922. He was the founder and for many years the leading spirit of Sinn Fein. He, more than any other man, was responsible for the success of the negotiations between the British and the Irish Republican governments which led to the establishment of the Free State. After the resignation of De Valera in 1922 he was elected president of Dail Eirann, and later of the Free State.

Grimm, Jacob Ludwig Karl, a great German scholar, was born at Hanau, Jan. 4, 1785. His first book was *Old German Minstrelsy*, soon followed by the famous collection of folk-lore and stories by the two brothers (Jacob and Wilhelm), called *Children and House Tales*, followed by a second volume in 1814 and the third in 1822. The brothers spent 13 years gathering these stories, mostly from the mouths of peasant-women. Jacob died Sept. 20, 1863, and Wilhelm on Dec. 16, 1859. Jacob's *German Grammar* is perhaps the greatest work on language-study of the era.

Grisi (*grē-'sé*), a celebrated singer, was born in 1811 at Milan, Italy. In 1828 she first appeared at Bologna in Rossini's *Zelmira*, and in 1832 her appearance in Paris in *Semiramis* created great admiration. But London was the scene of her greatest triumphs. Bellini's *I Puritani* and other operas were written for her, but *Norma* was her greatest rôle. In 1836 she married the Marquis de Melcy and, after his death, the tenor Mario in 1856. She also sang in America, where the purity, sweetness and volume of her voice, together with her great beauty, gained her hosts of admirers. Heine wrote of her as "the singing flower of beauty." She died at Berlin, Nov. 28, 1869.

Gris'tle is the common name for cartilage. It is a firm, elastic substance. It enters largely into the make-up of the animal skeleton. It forms a rudimentary skeleton in the higher mollusks and in certain fishes, hence called cartilaginous fishes. In man and the higher animals it forms a sort of nest for the growth of bone. Temporary gristles supply the place of bone in early life and are slowly changed into bone. For some time after birth the ends of the long bones are mainly gristle. Of permanent gristles, some cover the ends of bones which make joints, as those of the cranium, the knee-joint and the ribs, and are called articular cartilages. Others, because they are elastic, keep open passages, as the gristles of the outer ear, nose and edge of the eyelids, and are called membraniform cartilages. Gristle is white or bluish-white, and its basis is a variety of gelatine. It is elastic, not easily broken and will retake its proper shape when bent.

Grosbeaks, interesting members of the finch family. The well-known Cardinal Bird is the Cardinal Grosbeak (See CARDINAL BIRD). The rose-breasted grosbeak is a medium-sized bird; black above and white below, its breast marked with a patch of beautiful rose-color, spots of white on lower part of wings and tail; it has a noticeable blunt, yellow beak. The rose-flush on the breast and the rich, melodious voice distinguish it; the song, bringing to mind that of robin, oriole and wood-thrush, is heard both day and night. The male assists in the brooding. The nest for the speckled, green eggs is built in low tree or

ROSE-BREASTED GROSBEAK

bush, and is very loosely constructed. The bird belongs to the eastern United States, arrives in May, departs in September. The blue grosbeak is a little larger than the English sparrow, in color dark blue and black, has a heavy bill, is a more familiar bird in the southwest. It feeds largely upon rice. It, too, is a fine songster. The pine-grosbeak is a light red above wings with markings of black and white and gray, below a lighter red melting into pale olive; it has the heavy grosbeak bill. The pine-grosbeak belongs to the north and the evergreen forests, and only in the severe winter strays over the Canadian border. It feeds upon the seeds of pine and cedar and upon berries and buds.

Grote, George, historian of Greece, was born in Kent, England, Nov. 17, 1794. In 1810 he became a clerk in a bank founded by his grandfather, and there remained for 32 years in different capacities, rising finally to be the head of the bank, though devoting all his leisure to literary study. His first contribution was a paper in the *Edinburgh Review*, in reply to Sir James Mackintosh, on parliamentary reform. He became an intimate friend of James Mill, and followed him in his philosophy. A liberal in politics, he entered parliament in 1832 and was twice re-elected, though each time by a smaller majority. During all the time he was in parliament, he was, though unsuccessfully, a strong advocate of vote by ballot. In 1843 Grote retired from banking and devoted his entire time to his *History of Greece*, the first two volumes of which appeared in 1846 and the twelfth and last in 1856. It met at once with general favor, and has taken rank as the fullest and most complete history of Greece. Until the time of his death, on June 18, 1871, he held the offices of president of University College and vice-chancellor of London University.

Grouchy (*grōō'shē'*), **Emanuel, Marquis de,** French general, was born at Paris, Oct. 23, 1766. He entered the army at 14, taking sides with the Revolution, and first smelled powder in aiding to put down the Vendean revolt. He also served as second to Hoche in Ireland and under Joubert in Italy in 1798. In Piedmont he was taken prisoner while under Moreau, but was exchanged in 1799, afterward fighting with great bravery at Hohenlinden, Eylau, Friedland, Wagram and in the Russian campaign of 1812, having command in the memorable retreat of Napoleon's body-guard. On Napoleon's return from Elba he was made a marshal of France, and, marching north, routed Blücher at Ligny. Keeping strictly to the letter of his orders, he refused to march to Waterloo, and so indirectly caused the defeat of Napoleon. After the defeat at Waterloo and Napoleon's second abdication, as commander-in-chief of the armies he led them back to Paris, resigned, and came to America. He returned to France in 1819, was reinstated as marshal in 1831, and died at St. Etienne on May 29, 1847.

Grouse, a common name loosely applied to quail, partridges and true grouse. It should be restricted to the grouse. These birds are distinguished from quail and partridges by having the legs, feet and nostrils feathered, with bare skin over the eyes. In summer the toes are bare, but in winter they put on their "snow-shoes" — most of them dwellers in regions of heavy snow-fall and these birds largely ground-hunters. They live in both Europe and North America, and there are about 24 species recognized. Grouse are among the favorite game-birds. In England parliament closes when grouse-shooting begins. The ruffled grouse is a common species in the United States. Its home is from Massachusetts and northern New York to northern Georgia. While not abundant west of the Mississippi, it is found as far as the Dakotas, and is essentially a forest bird. It gets its name from the black ruff it wears in front of the shoulders. The lower part of its legs is bare, this being the only grouse with bare legs. In color it is rusty brown with mottlings of black, gray and white. This bird is improperly called partridge in the north and pheasant in the south. The male produces a drumming sound by the use of its wings; standing on the trunk of a fallen tree or some other elevation, the wings are stretched horizontally and beaten stiffly downward, slowly at first then increasing in speed until a sound like the roll of a drum is produced. This is to be distinguished from the booming sounds produced in other grouse by the air-sacs. The nest of the ruffled grouse is usually at the base of a tree or stump, and early in May from eight to 14 buff-colored eggs are to be found therein. The hen, when disturbed with her young, will limp and flutter about to distract attention from her chicks, these meanwhile hiding here and there, keeping very still when once secreted. Ruffled grouse, ground-birds with inconspicuous plumage, seek protec-

RED GROUSE

tion in hiding rather than in flight; but when taking to flight may make easy escape. Chapman in *Bird Life* says: "Quail, partridges and grouse, much to the amateur sportsman's discomfiture, spring from the ground as though thrown from a catapult, and reach their highest speed within a few yards from the starting-point."

The common prairie-hen or prairie-chicken, the pinnated grouse, at one time was very abundant in the wide prairie country; because of ignorance, carelessness and greed it now is nearly extinct. In common with other grouse it makes a booming sound in the spring by means of air-sacs located on the neck. The prairie sharp-tailed grouse belongs to the Great Plains, but, like the pinnated grouse, is fast disappearing. The sage-grouse, a cock-of-the-plains, feeds and thrives on sage-brush. It is the largest grouse found in America, a large male weighing about six pounds. It is a handsome, showy bird with an extremely long tail; on the side of the neck it has large air-sacs that produce a deep, hollow tone. The Canada grouse and blue grouse are other varieties, both sometimes spoken of as "Fool Hen" because of too-trusting ways. The ptarmigans (*tär'mi-gans*) are interesting members of the grouse family. With change of season these birds greatly change their appearance; snow-white in winter, in mid-summer their plumage is chestnut-brown barred with black. Ptarmigans are of great food-value to Eskimos and Indians, and have proved of help in time of need to various parties of Arctic explorers. They are found generally in Arctic America and Alaska. There are several species. A species found within the United States is known in Colorado as the white quail; another species is said to wander sometimes into northern New England. The red grouse (see illustration) of Scotland is a ptarmigan that does not turn white in winter. See PARTRIDGE and PHEASANT. See Hornaday: *American Natural History;* Abel Chapman: *Bird Life of the Borders;* and Frank Chapman: *Bird Life.*

Growth (in plants), permanent alteration of form, usually accompanied by increase in size, the latter being the only popular criterion of growth. In plants growth exhibits three features at different times. In the earlier phase the formation of new cells by division is characteristic. This is followed by the rapid enlargement of the cells. In doing this, the cells do not form a corresponding amount of new protoplasm, but take up large quantities of water, which is secreted into the center of the cell. The volume may thus be increased a thousandfold or more. In this feature the growth of plants differs most from that of animals. After enlargement has ceased, thickening (usually irregular) of the walls and sometimes the death and disappearance of the protoplasm ensue. The phase of enlargement is the only easily measurable phase of growth. It is studied by records or observations with the auxanometer (which see). Growth is dependent on a suitable supply of oxygen, food and water. It is greatly influenced in rate and amount by external agents, as heat, gravitation, light, etc. Because the heat and light vary periodically, corresponding to day and night, the rate of growth shows a daily variation, being usually most rapid during the night. Besides variations due to external causes, growth shows variations which are unexplained, but are supposed to be due to internal causes. Even when all the conditions affecting growth are uniform, its rate is at first slow, becoming more and more rapid till it reaches a maximum, after which it declines even more rapidly, until it ceases entirely. The duration of growth of any part is called the grand period to distinguish it from the daily period just mentioned. During both daily and grand periods, there also are minor variations in rate. The cause of the cessation of growth, even under favorable conditions, is not known.

Guadalajara (*gwä'thȧ-lȧ-hä'rȧ*), capital of the Mexican state of Jalisco, is the third city of the republic and lies in the valley of the Rio Grande de Santiago, 280 miles by rail from the city of Mexico. The city is beautifully laid out, has some fine public buildings, and is the chief seat of the cotton and woolen manufactures of the country as well as of pottery and metal wares. Population 118,799.

Guadalquivir (*ga̤'dȧl-kwĭv'ẽr*), meaning the great river, the largest river of Spain and the only one that all the year round has a full stream. It rises in the Sierra de Cazorla, flows 374 miles in a southwesterly direction, and empties into the Gulf of Cadiz. It is a slow, sluggish stream, only breaking into rapids near the Sierra Morena. It is navigable as far as Seville, 80 miles from its mouth.

Guadeloupe (*ga̤'dȧ-lo͞op'*), an island, one of the Lesser Antilles in the West Indies and the most important of those belonging to France. It is about 77 miles northwest of Martinique. It covers 494 square miles, and is divided into Grand-Terre on the east and Basse-Terre on the west by a strait called Salt River. Grand-Terre is a coral island. Earthquakes are frequent, and in the towns the houses are now built of wood or iron. Sugar and coffee are exported. The colony has a French governor. The island was discovered by Columbus in 1493, and colonized by the French in 1635. The area of the two islands is 583 square miles, with an estimated population of 182,000, including about 15,000 coolies. The chief town is Point-à-Pitre (population 18,000), with a fine harbor. The seat of government is Basse-Terre (population 8,000). The chief products consist of sugar, coffee, cacao, bananas, manioc, sweet potatoes, Indian corn and tobacco.

Guam (*gwäm*), the largest of the Ladrone or Marianne Islands in the north Pacific, ceded by Spain to the United States by the treaty of Paris, Dec. 10, 1898. The island is about 32 miles in length by 6 in width, and lies 1,500 miles from Manila and 4,000 from Honolulu. It is useful as a coaling station, possesses a good roadstead and about 12,000 of a population. It is a direct link in the chain of possessions between the United States (port of San Francisco) and the Philippine Islands. The climate is humid but salubrious, and the heat is tempered by the trade-winds. The capital is Agana (pop. 6,000.)

Guanajuato (*gwä-nä-hwä'tō*), capital of the state of Guanajuato, Mexico, is built on both sides of a deep ravine in the center of the large mining-district of the state. Its streets are narrow, steep and winding, although its houses are well-built and homelike. It is the seat of a great silver mining industry. The area of the state is 11,370 square miles, with a population estimated at 1,075,270. Population of Guanajuato, the capital, 35,147.

Guano (*gwä'nō*) and **Guano Islands.** Guano is the deposit of sea-fowl, found in immense quantities on certain coasts and islands where the climate is dry and free from rain. Its value in agriculture was well-known to the Peruvians long before the coming of the Spaniards. Alexander von Humboldt first brought specimens of guano to Europe in 1804. There are three classes of guanos: (1) those which have suffered little by the action of the air, retaining nearly all of their original matter, such as the Angamos and Peruvian guanos; (2) those which have lost a considerable portion of their soluble matter, but remain rich in their less soluble ones—the phosphates of lime and magnesia, as the Ichaboe, Bolivian and Chilean guanos; and (3) those which have lost nearly all their ammonia and contain but little more than the earthy phosphates of the animal deposit; in this last class must be placed the various African guanos and the West Indian, Kuria Muria (islands off the coast of Arabia), Sombrero, Patagonian and Shark's Bay guanos (Australia). Most of the so-called Peruvian guano has been obtained from the Chincha Islands off the coast of Peru. These are three small islands, often called the Guano Islands. Here multitudes of penguins and other oceanic birds build nests and breed and large deposits of guano have accumulated. Not one of these islands covers more than a mile. They are rocky cliffs, some 300 feet high, with many caves into which the waves dash. The whole supply of guano on these islands is now exhausted.

If the value of manure be calculated, as is done by chemists, according to the amount of nitrogen which it contains, one ton of good Peruvian guano is equal to 33½ tons of farmyard manure. Its value as a manure has become so well known and its use is so great, that it is gradually being used up.

Fish-guano is dried fish ground to powder. Mussels, five-fingers or starfish, herrings and particularly sprats are mostly used in this way. In 1862 the refuse of the Norwegian cod-fisheries was first used by drying the heads and backbones upon heated floors after sun-drying them on the rocks, then grinding them to powder between mill-stones. Fish-guano has grown rapidly in favor of late years among farmers, the supplies of guano proper being practically used up, and is the best-known substitute for the Peruvian guano. One ton of fish guano is said to be equal to 17 tons of farmyard manure. Guano is made in Canada and elsewhere from lobster and crab shells, which is said to be very valuable for gardens. The annual production of fish-guano from all sources, England, Scotland, Norway, Sweden, Newfoundland, Nova Scotia and the United States, is estimated at 75,000 tons.

Guantanamo (*gwän-tä'nȧ-mō̇*) **Bay,** an excellent bay and harbor on the southern coast of Cuba, about 40 miles east of Santiago, the scene of a historic engagement in the middle of June, 1898, between the Spanish and the United States troops, marines, war-vessels and transports. The American marines effected a landing and established and fortified Camp McCalla. This they held for several days against a superior force, until, aided by shells from the warships, the enemy was driven off. Guantanamo City, on the Guasco River, province of Santiago de Cuba, about 13 miles by rail north of its port, Caimanera, on the Bay of Guantanamo, has a population of about 7,250; while that of the district is close upon 30,000.

Guasimas (*gwäs'e-mäs*), **Las, Cuba,** the scene of a memorable engagement in the Spanish-American War, which occurred, June 24, 1898, at Las Guasimas, near Siboney, close to the landing point at Daiquiri, about 20 miles east of Santiago on the southern coast of Cuba. The conflict was between a Spanish force of 2,000 to 3,000, concealed in a dense jungle, and General Young's brigade of dismounted American cavalry, the brunt of the fighting being borne by a battalion of 450 men of Colonel Roosevelt's regiment of Rough Riders (volunteers) and 400 Regulars. The victory, though dearly bought, rested with the Americans, the Spanish, confused and disheartened, fleeing precipitately from the field.

Guatemala (*gä'tē-mä'lä*), a Central American republic (established in 1847), lying just south of Mexico and between the Gulf of Honduras and the Pacific. Its estimated area is 48,290 square miles, but the greater part is yet unexplored, thus making maps merely guess-work.

Surface and Drainage. The country is mountainous, and has several volcanoes, the most noted of which is Fuego (12,075 feet in height). Guatemala is well-watered and drained by its principal rivers, the Usumacinta, Polochic and Motagua. Its valleys are noted for their beauty and fertility. Its climate is warm, pleasant and generally healthy, its rainy season extending from April to October.

Natural Resources. Unexplored as it is, Guatemala has not yet developed the richness of its mineral resources; but gold, silver, iron, copper, coal, quicksilver, gypsum, salt and saltpeter are mined to some extent, while perhaps its greatest wealth lies in the richness of its soil.

Exports and Manufactures. Its chief exports are coffee, sugar, cacao, tobacco, cotton, sisal hemp, sarsaparilla and fruits. Its principal manufactures are woven fabrics, pottery and saddlery. The revenue in one recent year amounted to $34,000,000, and the expenditure to about $20,500,000. The military force under arms numbered 7,000 officers and men, besides the reserve.

Education. Free primary schools, of which there are 1,064, are being established and these have about 36,500 pupils. The capital is Guatemala la Nueva (pop. 96,560).

Inhabitants. About one third of its population is said to be of European descent and the remainder native; but this division is hardly correct, as it fails to take into account the many mixed and halfbreeds, which cannot be properly classified. The entire population numbers 1,992,000, about 60 per cent. being pure Indian.

History. Guatemala was conquered by Cortes in 1524, and for three centuries remained under a harsh rule before independence was declared. A confederacy, formed in 1821, was maintained until 1839, when it was conquered by Rafael Carrera, an ignorant Indian, who ruled until his death in 1865. During the presidency of General Barrios, from 1871 till 1885, the country made considerable progress in every direction. The legislative power is, together with the executive, vested in the president and the national assembly, who govern in accordance with the constitution of 1879. See Keane's *Central and South America* and Brigham's *Guatemala.*

Guayaquil (*gwī'ā-kēl'*), the capital of the province of Guayas, on the river of the same name, in the republic of Ecuador, South America. It lies at the head of an estuary of the Gulf of Guayaquil, about 170 miles south-southwest of Quito, and is the chief seaport of the republic. The city is well-laid out, and is adorned with a handsome cathedral, a university, bishop's palace and other fine edifices, though its low, swampy ground makes it unhealthy. It is subject to earthquake shocks, and its lack of good drinking-water produces epidemics of yellow fever. Its exports include cocoa, coffee, cotton, hides, rubber and nuts. The Guayaquil and Quito Railroad is now open from Duran (opposite Guayaquil) to Riobamba, while motor-cars run also from Quito to Riobamba. Population in the neighborhood of 80,000.

Guelph, in the county of Wellington, Ontario, has a population of 14,789. Sometimes it is called, because of its name, The Royal City. It owns its waterworks, gas and electric lighting works. Its park on the banks of the Speed is much admired. It is chiefly known because of the agricultural college located there. This college gives instruction in subjects connected with agriculture, combining practical and scientific work, to 800 students. Every alternate afternoon the students are required to take part in practical farming operations. The farm itself in connection with it contains 350 acres. The dairy-school is one of the best of the kind in any country. Graduates of this school are to be found holding high positions as professors and teachers all over the continent. The Macdonald Institute (founded by Sir William Macdonald of Montreal), in which teachers of home-science are trained, is located here. Guelph is the live-stock center of the province. Important manufacturing industries (carpets, organs, agricultural implements, etc.) are profitably established here.

Guelphs (*gwelfs*) and **Ghibellines** (*gib'-e-linz*), the names of two great parties, the conflict between whom forms a great part of the history of Italy and Germany from the 11th to the 14th century. The Guelphs composed the papal and popular party; the Ghibellines the aristocratic and imperial party. The names come originally from Welf and Waiblingen, the names of two German families, the former being still represented in the house now ruling in England. The names, as applied to the parties, came into use from the era of the battle of Weinsberg, fought in 1140 between Emperor Conrad and Welf. In this contest the cities of Italy took sides, Florence, Bologna, Milan, Modena, Ravenna and others siding with the Guelphs, while Pisa, Lucca and Arezzo were Ghibelline. The northern cities, as a rule, were Ghibelline, while the central and southern inclined toward the Guelphs, although all, as well as the leading Italian families, shifted and changed as occasion and interest required. This continued for years, until the mention of either name became a general signal for bitter personal warfare, the people no longer fighting from principle but from habit. See Bryce's *The Holy Roman Em-*

pire and Browning's *Guelphs and Ghibellines.*

Guiana (*gē-ă′nȧ*), a country in South America, lying between the Orinoco and the Amazon, with the Atlantic Ocean on the east. It is properly divided into five sections, but two of these are united with Brazil and Venezuela, the other three being British, Dutch and French Guiana.

Surface. There is a narrow strip of fertile soil bordering on the Atlantic, and in this lies the only agricultural wealth of the country. The rest forms a series of terraces and low mountains, in no place reaching a height of over 3,200 feet.

Climate and Drainage. The climate is hot and moist, the average temperature being 80° to 84° F., and the rainfall from 75 to 100 inches in British and Dutch Guiana and about 140 inches annually in French Guiana. The rivers of the country are many, forming a large chain crossed at their upper parts by many channels and canals, thus affording abundant irrigation, but are with difficulty navigated on account of mud-banks, sand-banks and rapids.

British Guiana or Demerara, with a coast-line of 320 miles, is separated from Dutch Guiana by the Corentyn River, the other boundaries on the south and west being yet unsettled. The total area, including the settlements of Demerara, Essequibo and Berbice, is 90,277 square miles. In the west there are two mountain-ranges running from west to east, the whole forming the Pacaraima or Parima mountain-system. Among the larger rivers are the Corentyn, Berbice, Demerara, Essequibo, Waini and Barima, all flowing north into the Atlantic. The chief exports are sugar, rum, molasses, timber, shingles, cocoanuts, charcoal and gums. The population, amounting to 305,090 in 1909, consisted of Europeans, creoles, negroes, coolies, natives of the Azores and about 7,650 Indians. The colony is divided into three counties, with the government at the capital, Georgetown (pop. 53,176), in the hands of a governor appointed by the crown and two legislative councils. New Amsterdam at the mouth of the Berbice River is a growing settlement. Besides the river-navigation, 450 miles in extent, there are some 40 miles of railway. The dispute between Britain and Venezuela over the international boundary was settled by arbitration, Oct. 3, 1899. British Guiana is rich in gold, the product of which in 1910-11 was 54,989 ounces, valued at $1,002,400. The revenue for the same year amounted to $2,815,000 and the expenditure to $2,714,000; while the exports were close upon $8,650,000 and the imports amounted to $8,750,000.

Dutch Guiana or Surinam, with a coast-line of about 240 miles and an area of 46,058 square miles, is bounded on the west by the Corentyn River, on the east by the Maroni River and on the south by the Acarai Mountains. Its other rivers are the Surinam, Soramacca, Coppename and Nickerice, all flowing into the Atlantic. The exports are bananas, sugar, rum, molasses and cocoa, although the total cultivated area is only about 210 square miles. Gold is also one of the exports since the discovery in 1875. Surinam's capital is Paramaribo (population 34,795), where resides the governor at the head of an executive council. The population in 1909 was 82,739, besides 4,000 negroes and 1,200 Indians. Slavery was abolished in 1863.

French Guiana or Cayenne, with a coast-line of about 240 miles and an area of 30,500 square miles, is separated from Dutch Guiana on the west by the Maroni and from Brazil by the Tumuc-Humac Mountains and the Oyapoc River. The other rivers are the Mana, Sinnamary, Kourou and Apporonague. The commerce of the country is almost nil. The country is unhealthy, and the number of inhabitants is gradually diminishing. The entire population in 1911 was 49,009. The area of the colony is 30,500 square miles; the capital is Cayenne (pop. 12,798). From 1853 to 1864 there was an attempt to found a penal colony, but on account of the unhealthiness of the climate it failed, partially, though in 1910 there was a penal population of more than six thousand. In 1909 the revenue and expenditure budget balanced at about 3,497,000 francs, independently of what the mother-country expends on the penal establishment.

History. Guiana was first explored by Europeans in 1499 and 1500; but the first permanent settlements were made by the Dutch about 1613 at Essequibo, by the English at Surinam in 1650 and by the French at Oyapoc in 1626. See *British Guiana* by Bronkhurst and *Dutch Guiana* by Palgrave.

Gui′do Aretin′us or **Guido d' Arezzo** (*gwē′-dō à-rĕt′sō*) (995–1050), was the first to use movable *do.* He is credited with the invention of the principle upon which the stave is constructed and with the *F* and *C* clefs. The claim to other inventions attributed to him is uncertain.

Guild (*gĭld*), the name of an association, many of which were formed and flourished during the middle ages. The exact purpose of the guild cannot be determined, inasmuch as it bore no resemblance whatever to the trades' union of to-day, although it consisted of an association of the merchant and industrial classes. Guilds are first mentioned in England in the 7th century and on the continent in the time of Charlemagne in 779. They were divided mainly into two classes: the merchant-guilds and the craft-guilds or, as we should call them, trade-guilds. The merchant's guild protected the business of its members, and opened and created markets for their wares. The craft-guild took care of the interests of its members, and saw that each one was skilled in the trade that the guild represented. On the whole, the guilds were useful in equalizing and harmonizing the interests of the producer and consumer. The first decisive move against guilds was made in England by Henry VIII, who confiscated all their property. They were abolished by legislation in England in 1535; in France in 1789; and in Germany in 1869. See *History and Development of Guilds* by Brentano; *Guilds, Their Origin and Constitution*, by Walford.

Guillotine (*gĭl'lō-tēn'*), an instrument used for beheading, was introduced by the convention during the French Revolution. It was named after its inventor, Joseph Ignace Guillotin. It was first erected in the Place de Gréve, Paris, on April 25, 1792, and was used to execute a highwayman. The guillotine is made of two grooved, upright posts, with a cross-beam at the top. In the grooves runs a heavy iron knife, with a slanting edge, which descends by its own weight upon the neck of the victim, who is bound to a board. An instrument of a like nature is said to have been used in Persia and in Italy, and during the 16th and 17th centuries one, called the *Maiden*, was in use in Scotland. It is popularly supposed that the inventor died by his own instrument; but in truth he died in bed in 1814. See *History of the Guillotine* by Crooker.

Guin'ea-Fowl, the name given to the common domestic guinea-hen and to its wild relatives. The domestic variety is commonly seen in poultry yards in the United States. The birds have a full body, a small head and short tail; their plumage is usually dark gray, marked with small white spots. These came originally from wild African birds, common in Guinea and southward toward the Cape. They are also found in the northern part of Africa, having been known to the Romans. The wild guinea-fowls are of three kinds — those with a crest of feathers on the head; those with a bony helmet and bare heads; and those with a patch of feathers on the back of the head. The crested variety is more graceful than the others; their plumage is black, dotted with small bluish-white or light green spots. The skin of the neck is bare, bluish in color and sometimes ornamented with bright red. The helmeted variety, from which the domestic form is derived, go in large flocks. They are very noisy, fast runners, wild and wary. Some species of this kind live also in Madagascar. They destroy many insects. A similar bird occurs in Jamaica, where they are destructive to crops and are shot like other game.

Guinea, French, is situated on the western coast of tropical Africa between Portuguese Guinea and the British colony of Sierra Leone, extending inland to the headquarters of the Gambia and the Senegal. Area about 95,000 square miles; estimated population 1,498,000. The country is administered for France by a governor, the capital being Konakry on the Isle of Tombo. Products: rice, gum, palm-oil, nuts, coffee and rubber. The colony was acquired by France in 1843.

Portuguese Guinea is situated on the coast of Senegambia, and includes the adjacent archipelago of Bissagos, with the island of Bolamo, in which the capital of the same name is situated. The chief port is Bissao. The chief commercial products are rubber, wax, oil, seeds, ivory and hides. The area of the dependency is 13,940 square miles, with a population estimated at 820,000.

Guinea (*gĭn'ē*), **Gulf of,** a part of the Atlantic Ocean, forming a large angle on the west coast of Africa between Cape Palmas and Cape Lopez. It receives the delta of the Niger on the northeast; while on the east are the islands of Fernando Po, Prince and St. Thomas.

Guinea-Pig, the popular name for a South American animal related to hares and rabbits. Its name is a curious mistake. It in no sense is a pig, and it does not occur in Guinea, but in Guiana, Bolivia, Brazil and some other parts of South America. Its common name is the cavy. The animal was domesticated in Europe in the 16th century, and is frequently seen in the United States. The animal has short incisor teeth and a very short or rudimentary tail. It lives wholly on vegetable food, and while feeding generally sits on the hind feet. It lives in burrows, and feeds at dusk and on dark days. It breeds with great rapidity, and is capable of bearing young when a few months old.

Guiscard (*gēs'kär'*), **Robert,** duke of Apulia and Calabria, the sixth son of Tancred de Hauteville, was born in Normandy about 1015. He won great renown as a soldier in Italy, and after the death of his brother was proclaimed count of Apulia. He captured the Italian provinces of Reggio and Cosenza, thus conquering Calabria, and was confirmed in possession by Pope Nicholas II. He now waged war on behalf of the pope, gradually defeating the Saracens in Italy and in Sicily. Later he was occupied in defending Michael VII of Constantinople (whose son Robert's daughter had married) from Alexius Comnenus, whom he defeated at Durazzo in 1081. He then proceeded toward Constantinople, but, hearing that Henry IV was in Italy, he hurried back and liberated the pope from St. Angelo, where he was besieged in 1084. Robert then returned to Epirus, defeating the Greeks, but, while in Cephalonia on his way to Constantinople, he died suddenly on July 17, 1085. See *The Normans in Europe* by A. H. Johnson.

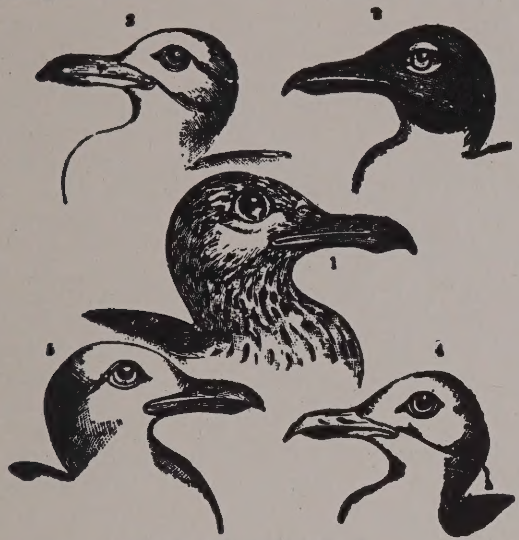
Guise (*gü-ēz*), **Henry, Duke,** of the family of Lorraine, a son of Francis, was born on Dec. 31 ,1550. The murder of his father by the Protestants filled him with bitter hatred toward them, and he fought against them at Jarnac in March, 1569, and at Moncontour in October, 1569, and forced Coligni to raise the siege of Poitiers. He was one of those who brought about the massacre of St. Bartholomew, Aug. 24, 1572. He was ambitious to become king, in place of Henry III, whom he defied and humilated to such an extent that the king procured Guise's assassination at Blois on Dec. 23, 1588. See *History of France* by Guizot and that by Yonge.

Guitar (*gĭ-tär′*), a stringed musical instrument resembling the lute, well-adapted as an accompaniment to the voice in singing and much used in Italy and Spain. It was introduced into Spain by the Moors. It has six strings, which are twitched by the fingers of the right hand, while those of the left hand make the notes of the music by being pressed on the fingerboard, which has frets (metal strips dividing it into notes) across it. The three highest strings are always of gut, the three lowest of silk spun over with silvered wire.

Guizot (*gē̆′zō̂′*), **François Pierre Guillaume,** a French historian and statesman, was born at Nîmes, France, of Huguenot parentage, Oct. 4, 1787. His father was guillotined in 1794, whereupon his mother took him to Geneva, where he was carefully educated, but he returned to Paris to study law in 1805. In 1809 he attracted attention by his review of Chateaubriand's *Martyrs*, followed by the *New Dictionary of Synonyms*, by an essay on the fine arts and in 1812 by a translation of Gibbon. He was appointed professor of modern history in the University of France shortly afterward. On the fall of Napoleon in 1814, Guizot was made secretary-general of the ministry of the interior, then secretary-general of the ministry of justice and in 1816 director-general and counselor of state. But in 1821, finding himself at odds with the Bourbon policy, he was deprived of all his offices, and four years later was prevented even from lecturing. He then published his *History of France* and *History of the Revolution in England.* In 1828 he was restored to his college-chair, and his lectures on the history of civilization in England, Europe and France, published as a *Course of Modern History,* made his reputation as one of the first historians of the day. In 1830 he returned to political life and held several important offices, being ambassador to England in 1840 and prime-minister in 1847. When minister of public instruction, he established a system of primary schools. On the fall of Louis Philippe in 1848, he escaped to London, but returned to Normandy during the Second Empire, devoting all his leisure to literature. He died in Normandy, Oct. 12, 1874. See *Private Life* by Madame Guizot de Witt and *Memoirs* by himself.

Gulf Stream, the largest and best known of all oceanic currents, derives its name from the Gulf of Mexico, out of which it flows as a stream of warm water along the east coast of the United States to Newfoundland, whence it takes a diagonal course across the Atlantic. This flowing of an independent and separate stream in a large body of water is caused by the action of the prevailing winds of the globe. In the Atlantic the waters near the equator are forced by the winds into the Caribbean Sea, through the Yucatan Channel, into the Gulf of Mexico, which is three feet four inches higher than the waters around Sandy Hook. This is occasioned by part of the force keeping up the flow of the Gulf Stream. The Gulf Stream varies from 50 miles in width to 300 at Sandy Hook, there spreading out in the shape of a fan. It travels from about six miles per hour at the Straits of Florida to three or four miles per day at its widest part in the Atlantic. It is divided into two parts off the coast of Europe, one part passing along the coast of Norway to the Arctic Ocean and the other along the coast of Spain and Africa. As it enters the colder waters, it sinks below the surface on account of its greater density, and is therefore warmer below the surface at Great Britain than off the coast of Africa. Its surface temperature averages about 77.5° F.

Gull, a long-winged water-bird with web-feet, inhabiting all parts of the world. The group to which gulls belong embraces also the terns, and these two kinds of birds are closely related. There is a popular notion that gulls have an undivided tail and the terns a forked one; this holds good for most forms, but not for all, as some gulls have forked tails and some terns wedge-shaped tails. There are about 100 species of these birds — 50 gulls and 50 terns. These graceful birds are seen flying over the water, both on large fresh-water lakes and at the sea-coast. Their cry is a scream, loud and powerful. No birds are more widely distributed than gulls and terns. One on a voyage, either on the Great Lakes or the ocean, is sure to see them flying about the vessel for remnants thrown overboard from the cook's galley. They are beneficial as scavengers, for they dispose of refuse floating on the water which might do harm if cast ashore. The gulls are larger and stouter than the terns. The predominating colors in both birds are white and gray, varying in shade. The feet and bill are usually brightly colored, frequently yellow or red. They feed on fish, floating scraps and, along the coast, on mollusks, the shells of which are broken by being carried to a height and allowed to fall. The common gull of North America is the herring-gull, abundant in bays and harbors, seen far at sea and also ranging far inland. Its winter home is in the United States; it nests from southern Maine to the Arctic Ocean. The common terns, frequently seen on Lake Michigan and the other Great Lakes, are most graceful birds in flight, and are often called sea-swallows. They are more slender than gulls, and have long forked tails and slender bills. These beautiful birds have been destroyed in immense numbers for trimming ladies' hats, but a crusade has been effectively waged against the wanton destruction and the birds are being saved from extermination. See TERNS.



HEADS OF GULLS

(1) Great black-backed. (2) Black-headed. (3) Killiwake. (4) Small black-backed. (5) Herring-gull.

Gun, a term often used to describe all firearms and still applied to cannon and other large artillery, though strictly it is limited to the sporting-gun or modern shotgun. The early firearms brought into use by the invention of gunpowder were known under different names; as "bombards" in Italy, "crackeys" in England, etc. In the 15th century they began to be grouped in classes. Bombards were short vessels from which stone balls were shot, and were the forerunners of the present bombs and mortars. Cannon were not much larger than the muskets of the 18th century. Culverins were cannon, and fired stone, shot, iron and leaden balls; these were used in England until after the Commonwealth. There also were hand-culverins used on horseback, weighing about 15 pounds, and some weighing 60 pounds were used by foot-soldiers. The "culverineer" needed a servant to help him to fire it, as the gun was supported on a forked rest. He had to carry, besides the gun, a flask of coarse powder for loading, one of fine powder for priming, a bag of bullets, a musket rest and a burning match. From improvements in the culverin the matchlock was developed, with its varieties of arquebus, hackbutt and musket. These early firearms were loaded with difficulty, as they had to be placed on the forked rest attached to the gunner's wrist, and the match, a slow-burning fuse, gave a great deal of trouble in damp weather. In a battle in 1638 the musketeers fired only seven shots in eight hours. The firelock or flintlock, with its new method of firing, was introduced in Spain about 1625, and is said to have been the invention of highwaymen, as the burning match dangerously betrayed their presence. It was used in the English army from about 1688 to 1840. The first pistols were made in 1540, and were first used as concealed weapons. Double and four-barreled pistols were common in the 18th century, and the revolving pistol, called the "pepper-box," preceded the modern revolver. About 1890 it began to look as if an automatic pistol would replace even the seven-cartridge revolver. The best known sorts are the Burchardt-Luger, Colt, Männlicher and Mauser. The gas made by firing operates the mechanism. It opens the breech, extracts and expels the cartridge, and reloads and recloses the breech. The man merely refills the chamber and pulls the trigger. The Burchardt fires 48 shots in 28 seconds. But a revolver has been invented that almost equals an automatic pistol in rapidity of fire, and also uses regular ammunition. The shotgun or sporting rifle is carried to the greatest perfection in England. The range is about 45 yards, and the shot will strike a target 120 feet distant in thirteen hundredths of a second after pulling the trigger. Smokeless powder is used in these guns. The finest shotguns, made by the best-known gunsmiths, are valued at $200 apiece. The introduction of smokeless powder opened a new era. The newest model of the United States Springfield rifle surpasses that of 1892. It has a magazine, like a box, that is situated under the receiver. The cartridges are loaded from a clip. Twenty shots have been fired in 28⅗ seconds. The bullet travels 2,300 feet a second, penetrating 4½ feet of white pine, and the range is five miles. The new Springfield is almost one tenth faster than the old one, and nearly one fifth more accurate. Its only equal is the 1903 Mauser. Some armies are replacing their magazine-rifles with automatic rifles. The Woodgate automatic rifle holds 20 cartridges, fires 200 rounds a minute, and can be fitted to old makes. The Maxim automatic, firing 600 rounds per minute, is a notable machine gun: the one-pounder Maxim-Nordenfeldt (automatic) gun was in use in the Spanish-American War and has been adopted in the U. S. navy. Other machine-guns in use are the Gardner and the Colt gun, the Hotchkiss two and 12-pounder mountain-guns. The modern improvements in guns are largely in what are known as quickfiring or machine-guns. The guns used in Europe are made chiefly at the Krupp works or by Sir William Armstrong in Newcastle, England, whose guns are equally famous. See CANNON, RIFLE, REVOLVER and ARTILLERY. See *The Gun and Its Development* by Greener; *Modern Shotguns* by the same; and *American Inventions and Improvements in Small Arms, Machine-Guns etc* by General Norton.

Gun' boat, a small vessel armed with large guns and principally used for service on the coast and in rivers In their more modern form they have one large gun in the bow, pointed by a helm or by screws, these being only a floating gun-carriage. In 1907 the United States navy had 37 gunboats and in the same year Great Britain had 36.

Gun'cot'ton is an explosive substance made from cotton-wool. The first experiments were made by Schonbein, a German chemist, in 1845, who found that cotton-wool, dipped in a solution of nitric and sulphuric acids, could easily be set on fire, and while burning would explode. He called the new compound guncotton and proposed its use in place of gunpowder. Many experiments followed the discovery, and several attempts were made to introduce it into use. Its principal advantages over gunpowder are that it is not injured by water, and so it can be carried in a damp state, which makes it perfectly safe, and that it is smokeless. It is used in war largely for torpedoes and in mines. It is now used, after many unsuccessful attempts, as a constituent of certain smokeless powders. In the pure condition its explosion is too violent for use in guns, but by proper additions of other substances its speed of burning may be retarded. See *Handbook to Modern Explosives* by Eissler.

Gun'nery is the system of laws which regulates the making and using of all kinds of firearms, though the term "musketry" is sometimes given to the scientific use of small arms. The first book on the subject was written by an Italian mathematician, Tartoglia, who published his *New Science* in 1537. He also invented the gunner's quadrant. Galileo followed with his *Dialogues on Motion* in 1638. The real founder of the science was Benjamin Robbins, whose *New Principles of Gunnery*, published in 1742, treated of the force of gunpowder, the resistance of the atmosphere, etc. His invention for measuring the velocity of a cannon ball was used until superseded in 1862. In the use of firearms many problems have to be solved, and it has become one of the exact sciences. By means of mathematical tables and other instruments the proper length, thickness and size of a gun, the charge, form of the ball, the time of flight, distance to which it will reach and elevation required for any range are all calculated, and every gun has its range-table, as it is called, set forth with all these items for the gunner's use. See CANNON, RIFLE and GUN. See *Textbook of Gunnery* by Mackinlay.

Gun'powder, an explosive mixture of saltpeter, charcoal and sulphur, well-known all over the world. The proportions of these materials used vary in different kinds of powder, as also in various countries. Its origin and early history are obscure. Fireworks were known in China at a very early period, but whether the Chinese or any other Asiatic people invented modern gunpowder is doubtful. It was, in any case, left for more western nations to develop the discovery of the Chinese; we find it first used by the Byzantine emperors, under the name of Greek fire, in the defense of Constantinople against the Saracens in the 7th century. Its first use in Europe in its present form was in Spain, both by Christians and Moors, in the 12th century, who had some rude sort of artillery. Roger Bacon first introduced it into England. This was early in the 13th century, but its preparation was so imperfect that it was of no use, until a German monk, Berthold Schwarz, about 1320 introduced a new method of manufacture. From that time the use of gunpowder became general throughout Europe, the Russians, who in 1889 celebrated the 500th anniversary of its introduction into Russia, being the last to adopt it. In Queen Elizabeth's reign its manufacture was commenced in England, the great bulk used there having been obtained from abroad. At Waltham Abbey, a market town in Essex on the Lea River, 12 miles north of London, are the English government's gun-factory, gunpowder mills and large corditeworks. The English royal laboratory and ordnance-factories are at Woolwich. The materials used in making gunpowder — saltpeter, charcoal and sulphur — are first ground very fine, then mixed by hand in the proportion of 75 per cent. of saltpeter, 15 of charcoal and 10 of sulphur. When mixed they are wet, and worked in a powder-mill into a cake called a mill-cake, which is crushed into meal. This meal is again pressed into cakes, and the cakes broken into pieces and passed through a machine, which forms the powder into grains. It is then sifted, dusted, glazed, and dried in a hot drying-room. These processes vary as different kinds of powder are wanted. In the last few years there have been many improvements in firearms, and with these changes has arisen a demand for new varieties in gunpowder — especially for smokeless powder. This is a high powered explosive used as a substitute for gunpowder in firearms and cannon. It is a compound of guncotton and cellulose nitrate, the latter consisting of sawdust which has been soaked in nitric and sulphuric acid. Smokeless powder, as indicated by its name, makes no smoke or very little, and does not foul the gun as does gunpowder.

Powder is classified according to the size, shape or structure of its grains; as mealed, superfine, fine, large or coarse, cubical, hexagonal, spherohexagonal, etc. See GUNCOTTON and Thomson's *Dictionary of Explosives* and *Treatise on Ammunition.*

Gunpowder Plot. This plot was planned by Robert Catesby, a Roman Catholic gentleman of England, who, with his fellow-conspirators, had been driven to desperation by the faithlessness of King James I. James had, before his accession to the throne, led the Roman Catholics to expect some degree of religious toleration, but shortly after he began to reign he not only put the penal laws against Catholics in full force, but showed an inclination to increase their severity. Early in 1604 Catesby told his plan to John Wright and Thomas Winter, and they brought over from Flanders a brave soldier serving in the Spanish army, named Guy Fawkes, who, together with one Percy, was admitted to the plot after taking an oath of secrecy. The plot was to destroy at one blow the king and both houses of parliament and at the same time raise an insurrection in the midland counties. On the 24th of May, therefore, Percy rented a room adjoining the parliament house, which they intended to undermine. But, because of the closing of parliament, the work was put off until December, when digging was begun. The work proved harder than expected and the men changed their plan, admitting new conspirators and renting a cellar under the house of lords, where they hid casks of gunpowder with faggots. Everything was ready by May. But the plot was betrayed. Guy Fawkes entered the cellar a little before midnight on Nov. 4 to start the flames, and was arrested. Catesby hurried to Warwickshire to raise his friends there. They were there attacked a few days later, Catesby and several others were killed, and the prisoners taken were committed for trial and the whole plot revealed by their confessions. The trial proved that the Roman Catholics, with the exception of the few engaged in the plot, had nothing to do with it.

Gunsau'lus, Frank Wakeley, a Congregational clergyman and educator, was born in Ohio, Jan. 1, 1856; graduated at Ohio Wesleyan University in 1875; and was ordained to the Methodist ministry. He has been pastor of Congregational churches in Columbus, Ohio; Baltimore, Maryland; and Chicago, Illinois. In 1899 he accepted the pastorate of Central Church, Chicago, the famous independent church of David Swing, and for some years before he had also been the first president of Armour Institute of Technology, resigning this post in 1901. He likewise is an eloquent and popular platform-speaker, his oratory being of the Spanish or rhetorical class, and is the author of the valuable historical romance *Monk and Knight*, a tale of the Renaissance and Reformation.

Gusta'vus I or **Gusta'vus Va'sa,** king of Sweden during 1523–60, was born in 1496 of a noble family named Ericsson. As a boy he was active in the struggle against Denmark, and was carried off with other nobles to be held as hostages in Denmark. He, however, escaped, and, returning in a roundabout way, tried to revive the waning interest in the struggle with the Danes, but could not, and had to resort to work in the fields and mines for a livelihood. At last the "blood-bath" of Stockholm in 1520 aroused the Swedes, and he raised a sufficiently large army to wrest city after city from the Danes, until finally the capture of Stockholm in 1523 drove them from Sweden. That same year he was elected king. He then devoted himself to restoring the country, fostering trade at home and abroad, and building roads, bridges and canals. He died on Sept. 29, 1560, leaving his country with an army of 15,000 men, a good fleet, a full treasury and many schools and colleges. The first efforts at Christianizing Lapland and Finland were due to him. See *The Swedish Revolution under Gustavus Vasa* by Watson.

Gustavus II or **Gustavus Adolphus,** king of Sweden from 1611 to 1632, was born at Stockholm, Dec. 19, 1594. He was highly educated, knew eight languages and was a fine musician. Upon coming to the throne, when 17, he found his country involved in wars and internal quarrels; and reorganized his government by promising the nobles their privileges, subject to military service to the crown. He then defeated Denmark, and in 1617 concluded peace with Russia, recovering many cities which had been lost. In 1618 he traveled secretly through Germany, and two years later he married the daughter of the elector of Brandenburg. He next turned his attention to Poland, ending the dispute by a six years' truce in 1629. In 1630 Gustavus marched into Germany at the head of 15,000 men to join the Protestants against the Catholic League. The German forces were under the command of Tilly and Wallenstein, but the latter was soon removed from the service. Gustavus waited long for the Protestant princes to join him, but they did not do so until Tilly had taken the rich city of Magdeburg and burned everything but the cathedral. Soon after, Gustavus defeated Tilly at Breitenfeld, took the

Palatinate and Mainz, and in 1632 defeated Tilly at the Lech. Then the emperor, Ferdinand II of Austria, recalled Wallenstein, who raised an army of 60,000 and advanced to Nuremberg to await the Swedish army on its way to Vienna. On Nov. 6, 1632, at Lutzen near Leipsic, they came together in a dense fog, and Gustavus, becoming separated from the cavalry at whose head he rode, was surrounded by a body of Croats and killed. He was the great hero of the Thirty Years' War. See *Memoir* by J. L. Stevens; *Gustavus Adolphus in Germany* by French; and Schiller's *Thirty Years' War.*

Gus'tavus V, king of Sweden, was born on June 6, 1858, and became king on December 8, 1907, at the death of Oscar his father. In 1881 he married a daughter of the duke of Baden, thus uniting the rights of his house with the claims of the House of Vasa, as his wife is a descendant of the last Vasa king. As regent frequently after 1896, when King Oscar was sick or absent, he displayed qualities that changed public opinion from suspicion to respect. But estimates of his character and future policy differ. As most of his friends are business men and he is not intellectual and artistic like his father, he will probably be a more practical ruler. It is declared that he has no tendency to tyranny, and it is asserted that in foreign policy he leans to Germany.

Gutenberg (*goo'ten-berg*), **Johannes,** the inventor of printing with movable type, was born about 1400 in Mainz (Mayence), Germany. His proper name was Gensfleisch or Gansfleisch, which means Gooseflesh. In 1434 he lived in Strassburg, teaching stonecutting, mirror-polishing and other similar arts. Between 1444 and 1448 he returned to Mainz, where in 1449 or 1450, he entered into a partnership with Johannes Faust, who furnished the money to set up a printing-press. This partnership was dissolved in 1455 by Faust bringing a suit against Gutenberg to recover money advanced, and Faust gained control of the press. Gutenberg however, assisted by Dr. Homery, set up another press, at which he wrought until his death in 1468. A bronze monument, the work of Thorwaldsen, has been erected to his memory at Mainz. There are a few copies preserved of books printed by him, which bring enormous prices. See *Memoirs of Celebrated Characters* by Lamartine.

Guth'rie, Okla., a town (founded in 1889), formerly capital of the state of Oklahoma, situated on the Cimarron River, and on the Atchison, Topeka and Santa Fé and 'Frisco railroads. It is the center of a fine grazing-country, which also produces grains, potatoes, broom-corn, etc. Though but recently converted from the prairie, and in 1890 having a population of only 5,333, it now is a city of 11,654 inhabitants. It contains several saw, flour and planing mills, carriage and furniture factories, cotton-gins, cottonseed-oil mills and railroad repair-shops. Besides excellent public schools, it has a $50,000 county high-school, St. Joseph's Academy and the Capitol University.

Gut'ta-Per'cha. See INDIA-RUBBER.

Guyot (*gē̆'yō̆'*), **Arnold,** a geographer, was born in Switzerland in 1807, took his degree in Berlin in 1835, was the colleague of Agassiz at Neuchâtel during 1839–48, and in that year came to America with him. A course of lectures delivered by Guyot at Lowell Institute, Boston, was translated and published under the title of *Earth and Man* in 1853. He was appointed professor of physical geography and geology at Princeton in 1854, and manager of the meteorological department of Smithsonian Institute, where he delivered courses of lectures, publishing in connection therewith *Meteorological and Physical Tables* and a *Treatise on Physical Geography.* From 1874 to 1877 he was joint-editor of *Johnson's Cyclopedia.* Guyot died at Princeton, N. J., Feb. 8, 1884.

Gwalior (*gwä'lĕ-ôr*), the capital of a state of the same name in central India, is built on a rock 300 yards wide by one and a half miles long and 340 feet in height, forming a citadel that is almost impregnable. At the base lies the old city, containing little but a beautiful old white mausoleum or vault for the dead. To the southwest the new town of Lashkor extends, and four miles to the northeast is Morar, the British cantonment. Gwalior has two beautiful Hindu temples and one of the most interesting specimens of palace-building in India. Population 118,000. Gwalior, the state, one of the central native states in British India, has an area of 25,041 square miles, with a population of 3,090,798.

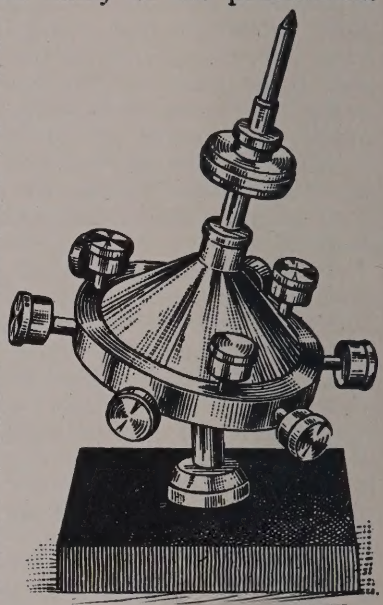
Gymna'sium and **Gymnas'tics.** The word gymnasium, from a Greek word meaning naked, was applied to the public places where the Greek youths took exercise. They were fitted with running-paths, wrestling-rings, baths and halls. They were a great resort for teachers and philosophers, and possibly from this the higher German school, which corresponds to the grammar-school grade in public schools, is called a gymnasium. Gymnastics, from the original meaning of the word, might be supposed to include all classes of athletic exercise; but, strictly speaking, gynmastics, as now used, means only in-door exercise and the strengthening of the muscles of the body. These exercises and games are so old as to be almost prehistoric, being alluded to in the *Iliad.* They were part of the course of education, and were made up of running, leaping, dancing, wrestling, boxing, hurling, etc. But they gradually fell into disuse, only to be revived by the Germans in 1774 and 1784, and they have been in great use ever since. Gymnastics may be divided into two classes, one with apparatus and the other without apparatus. The latter has been especially studied in Sweden, where it consists of various movements of the arms, trunk and legs, alone or together. The next in simplicity is exercise with movable apparatus, such as dumb-bells and Indian clubs. Then come the horizontal bar, the parallel bars, the rings, trapeze-bar, climbing-poles and ropes and weights and pulleys. The value of gymnastic exercise cannot be computed, inasmuch as it strengthens and builds up every part of the frame. Beginners, however, should be careful to take their training under the guidance of a proper instructor.

Gym′nosperms, one of the two great divisions of seed-plants (*Spermatophytes*). The most familiar gymnosperms in temperate regions are the pines, spruces, cedars etc., plants which are commonly called evergreens. About 400 species of gymnosperms exist to-day, and are a remnant of a former, much larger display. The common pine may be taken as a type, and its principal structures will serve to represent those of the whole group. The plant-body consists of a central shaft which extends to the very top, with lateral branches spreading horizontally in diminishing length to the top, forming a conical outline. This body is clothed rather densely, particularly at the extremities of the branches, with characteristic needle-leaves. These leaves are poorly adapted for leaf-work, but are well adapted for enduring hard conditions. The stamens and carpels are borne in separate clusters, which are known as cones or *strobili.* In the ordinary forms the staminate and carpellate cones are on the same tree. The staminate cones are very small and attract little or no attention. The carpellate or pistillate cones, on the contrary, become very large and conspicuous, developing in size and changing in structure as the seed matures, until sometimes they become very large, the scales being hard and even bony. If one of the carpellate cones be examined, it will be found that near the base of each of the hard scales there is a pair of seeds. It is the fact that these seeds are exposed, rather than inclosed, which gives the name gymnosperm to the group, meaning naked seeds, as opposed to angiosperms, which means seeds inclosed. Among gymnosperms the pollen is transported from the stamens to the ovule-bearing cones by means of the wind. This habit of wind-pollination demands the development of pollen in great quantity and of a very dry, powdery character. In the true pines each pollen-grain has two wings to aid in this wind-pollination. So abundant is this pollen that sometimes it descends in showers, covering the surface of the ground over large areas with a deposit of yellowish material which is often taken for a “shower of sulphur” by the uninitiated, and probably is referred to by local newspapers under that head. If a wind, during the pollinating season, happens to be very strong, these showers of pollen may descend in regions far distant from the pine-forest. Four living groups of gymnosperms are recognized: (1) Conifers, represented by the ordinary pines, spruces, hemlocks etc. of temperate regions; (2) Cycads, fern-like gymnosperms, restricted entirely to the tropics; (3) Ginkgo, the ordinary maiden-hair tree, chiefly existing at the present time in cultivation; and (4) Gnetums, a curious group of widely-scattered plants growing in the deserts and the tropics. In addition to these four living groups no less than two extinct ones have been made out from their fossil forms, one of the largest groups existing during the coal measures and having become extinct at that time. See CONIFER, CYCAD and GINKGO. JOHN M. COULTER.

Gypsies (*jĭp′sĭz*), are a wandering race of people found all over the world, being peculiar alike in their looks, language and manner of living. How they got the name of gypsy or where they originally came from is not known. That they are from the east is generally admitted; but as to the probable antiquity of the *Rómani*, as they call themselves, the ablest scholars are divided. As a race they are good-looking, with a tawny, olive skin; a dark, lustrous eye; very white teeth; black or dark-brown hair, rather coarse and frizzled; a graceful form; and finely-made hands and feet. These bodily peculiarities are as marked as are those of the Jewish people. In character, also, they seem to stand apart and alone. The better kind are quick-witted, courteous and trustworthy —when trusted; lavishly generous with one hand, while they grasp a bargain with the other. Having no ambition and leading a kind of cuckoo-like life, their aim seems to be to make the best of this life, as they find it, thinking little and caring less for the future. Their piety, when they assume any, is largely cant, and the faults of these ‘spoiled children of nature” are very similar to those of our native American Indian — boastful, crafty, superstitious, thriftless and indolent — with a passionate streak added. They break most of the ten commandments — but lightly — great crimes being rare among them. Their specialties of horse-dealing and fortune-telling favor easy ideas of right and wrong; while their views on what is mine or thine are decidedly loose. They excel as tinkers and blacksmiths. Their language is a bond of universal brotherhood, for gypsies everywhere speak the same Rómani or gypsy-tongue, in Turkey, as also in England, Finland and Italy, the gypsy calls himself "rom" (man or husband), from which come "romni" (female gypsy — woman or wife) and the adjective "rómano" (gypsy). This may account for the supposed Egyptian origin of the race, the ancient Egyptian "rôme" being man. They were traced as late as 1417 from the east through Germany, Switzerland, Italy and France; while in 1447 they reached Spain; Poland and Russia about 1501; Sweden in 1512; and England in 1514. They have been protected by kings, popes and nobles; Emperor Sigismund, Pope Martin V, an Earl of Surrey, James IV and Archduke Joseph of Austria being among the number of their friends. They have also been persecuted in many countries, charged with kidnapping children and acting as spies. They number in Europe about 700,000. Asia has thousands of them, and they are constantly emigrating to the United States and Australia. See Borrows' *Rómany-Rye.*

Gyp′sum. Gypsum is a mineral composed of lime sulphate in combination with water. Translucent varieties are known as *selenite*, and very fine grades of the material, of white color and special luster, are known as *alabaster*. When heated, the water of the gypsum escapes and the mineral becomes a white powder. If moistened, this powder "sets." This material is known as plaster of paris, the name being due to the fact that gypsum was early used near Paris for the making of plaster or cement. Plaster is also used as a fertilizer on land. Gypsum occurs in various states of the Union, notably Iowa, Kansas, Michigan, New York, Ohio and Texas. It is also worked to some extent in Arizona, California, Colorado, Montana, Oklahoma, Oregon, South Dakota, Utah, Virginia and Wyoming. The workable beds of gypsum are deposited in salt lakes. As the salt water becomes more and more concentrated, the gypsum is precipitated before the salt. Gypsum is therefore often associated with salt-deposits, but since it is often deposited from water which is not saturated with salt, it is sometimes precipitated from lakes which never deposit salt. Gypsum occurs in many sedimentary rocks in the form of single crystals or in groups of crystals. In some parts of the west, as in parts of New Mexico, the gypsum occurs at the surface, and its fine particles are blown about like sand, making dunes.

Gyroscope (*jī′rō-skōp*), an instrument used to illustrate many of the phenomena which occur in the dynamics of rotation. It consists of a fly-wheel with a heavy rim, supported in such a way that it may rotate freely about any one of three axes, each at right angles to the other two. The instrument was designed by Bohnenberger (1817) and perfected largely by Foucault (1852) for the purpose of illustrating the various motions of the earth, especially the stability of the axis of rotation, the rate of rotation and the precession of the equinoxes.



MAXWELL'S DYNAMICAL TOP

The theory of the gyroscope is too intricate for our limited space. For an attractive elementary presentation of this subject, see Worthington's *Dynamics of Rotation* or Perry's *Spinning Tops.*

The accompanying figure shows what is perhaps the simplest and most beautiful of gyroscopes, namely, Maxwell's dynamical top. This instrument is supported at its center of gravity, and the three axes about which it may rotate all intersect at this point of support. An ordinary top is merely a gyroscope which is supported below the center of gravity and on a plane.

H

H (*aitch*), the eighth letter, is a quasi consonant formed in the same place as the vowel following. It is best known as the rough breathing, and differs in many respects from other breath-sounds. Abruptness is what most distinguishes it. It is silent in a few words, as *hour*, and is often dropped by uneducated English people. It is used with some consonants to form digraphs not in the alphabet, as *sh* or *th*. With others, as *c* or *p*, it is used to modify their sounds, as in *charm* or *phantom*. In some words *h* after *c* or *g* causes them to remain hard before *e*, *i* or *y*, as in *chemistry*, *Ghibelline*, *chyle*. Its form is that of the Greek *eta*.

Haakon VII, king of Norway, was born at Copenhagen on Aug. 3, 1872, and became king on Nov. 20, 1905. He is a grandson of the late King Christian IX of Denmark and the second son of King Frederick VII. He was educated in the Danish public schools and at the naval academy. He served as a lieutenant in the national navy, and on July 22, 1896, married Princess Maud Alexandra, the youngest daughter of Edward VII of England. In 1905 he was asked to become a candidate for the Norse throne, accepted through his grandfather and on November 12 and 13th was elected by the people's vote, those who opposed him being in favor of establishing a republic. The national legislature ratified the election on Nov. 18, and the new king landed on the 25th. He has a son, Crown-Prince Olaf, who was born on July 2, 1903.

HAAKON VII.

Haarlem (*här'lem*), the chief city of the province of North Holland, in the Netherlands, is ancient and interesting in many ways. It is intersected by an extensive system of canals, which bring the shipping through the streets of the city. The houses are built in the typical Dutch style, having gable ends and old-fashioned crow steps. Objects of interest are the old market, built in the 16th century, and the cathedral of St. Bavo, one of the most famous churches in the Netherlands. It was built in 1538, is 426 feet in length, and has a tower 253 feet in height. Haarlem is the seat of several noted scientific, theological and benevolent institutions. In the 15th century the city was famous for its cloth-weaving and brewing, containing in 1594 no less than 120 breweries. Later the weaving of silk, lace and damask was introduced by the French, and gave employment to 10,000 of the population. At the close of the 18th century these industries had greatly declined, and the population was reduced. Early in the 19th century Haarlem began to turn its attention to new lines of manufacture, and has greatly prospered. Population 70,299.

Habak'kuk, one of the twelve minor prophets of the Old Testament. He prophesied near the close of the 7th century B. C. His personal history is unknown. In his book he appears as a prophet of Judah, announcing the divine punishment which is to come upon his native land at the hands of Nebuchadrezzar, and his aim was to lead his people to trust in the God of Israel. Both as a poem and as a prophecy his book holds high rank among the Old Testament Scriptures.

Hab'berton, John, an American author and journalist, was born at Brooklyn, N. Y., Feb. 24, 1842. He was educated in the public schools of Illinois, his family having moved to that state. He served in the army during the Civil War, became literary editor of the *Christian Union* in 1873, and later was literary critic on the staff of the New York *Herald*. In 1876 he published *Selections from the Spectator* and *Helen's Babies*, a humorous sketch which attracted immediate attention and reached an immense sale. Since that date he has written many books belonging to the field of light literature,—*The Jericho Road*, *The Barton Experiment*, *Some Folks*, *When Boys were Men* etc.

Ha'beas Cor'pus (meaning "have the body"), the writ served upon a sheriff or person having charge of a prisoner, commanding him to produce the body of the prisoner in court before the judge issuing the writ, at a specified time, and to state the cause why the prisoner is detained. The *Habeas Corpus* Act was passed in the reign of Charles II, 1679. Previous to this time it had been possible for those high in authority effectually to rid themselves of their opponents for long periods of time by having them imprisoned upon some charge, and the Habeas Corpus Act was passed to prevent this abuse of authority by illegitimate detention of persons in prison without a trial. The United State law is practically the same as the English, having been copied from it.

Hab′it. By habit is meant a method of responding to certain stimuli that has been learned or acquired by its possessor. Habit is thus distinguished from instinct, in that the latter is inherited. Both depend upon association (see ASSOCIATION OF IDEAS) or pathways of discharge that exist between sensory and motor centers in the nervous system. The reflex actions and the instincts depend on hereditary associations existing largely in the spinal cord and in the ganglionic masses at the base of the brain, whereas habits depend upon associations established in the cortex of the cerebrum as a result of experience. In the human being bodily control is much more dependent upon habitual coördinations than in any of the lower animals. Hence the helplessness of infants before habits have had time to form.

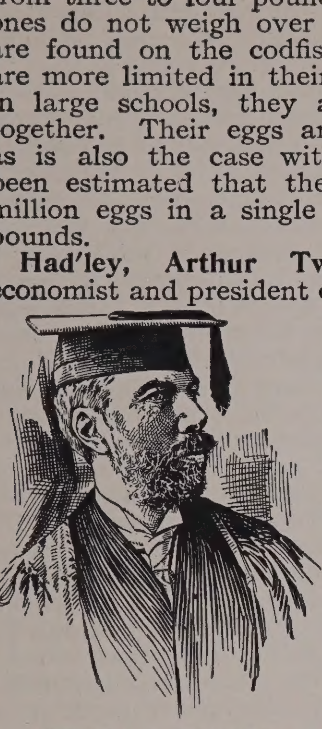
The method by which habits are established may be roughly indicated in the following example. Speech is a habit dependent in general upon the formation of associations between the auditory lobes lying in the temporal regions of the brain and the motor-areas controlling the vocal organs, which lie more toward the front. One hears a sound, and in the endeavor to make it produces a sound more or less like the model. The nervous currents have discharged in a random way from the auditory into the motor-regions. The reaction is an experiment that is repeated or not, according as its result approximated to the desired sound. Experimentation continues until an entirely satisfactory result is gained, when by repetition the effective pathway of discharge is strengthened until it becomes the habitual one. Thereafter the individual will tend unconsciously to respond to the hearing of the sound by making it. Further, the auditory tracts may become associated with other sensory areas, so that, for instance, when one sees a horse, he instantly thinks of the sound of its name and tends to utter it. This utterance may be checked by other impulses tending in other directions. The simple acts governed by single stimuli become themselves coördinated into complex acts by the association of their stimuli. A simple suggestion may thus start off a complicated series of actions, as in walking, speech, playing the piano etc. Here the sensation of having done one act constitutes part or all of the stimbus for the next.

Habit is indispensable to practical efficiency. Through it action is simplified by the elimination of useless movements. This insures accuracy and rapidity of reaction to a situation. It also gets rid of much of the fatigue involved in experimental activity. Most important of all, consciousness is relieved from the strain of active superintendence over habitual acts. This permits it to attend to new matters. Every useful habit formed is so much gain toward larger achievements. On the other hand, every useless or injurious habit is a positive check to such advance. Worse: when the habit is formed the mind finds it difficult or impossible to take charge again of the reaction in order to remedy it. We are thinking of other things, and have acted in the habitual way before we can check ourselves. Usually only such constant watchfulness as seriously impairs our efficiency in other fields will avail. Professor Bain gives the following rules for breaking old habits or forming new ones: first "launch yourself with as strong and decided an initiative as possible;" and, second, "never suffer an exception to occur until the new habit is thoroughly rooted in your life."

Habit does much toward making the man, the social order and the race what they are. It is, as Professor James declares, the great conservative force in society. When one has fixed his habits of life, he has practically determined what he shall be. He may change in this or that detail, but the mass of characteristics can not be modified. At 20, Professor James thinks, our personal habits, such as those of speech, manners, dress etc. are practically formed, and by 30 our intellectual and professional habits are well-established. The question of generalized habits is discussed under MENTAL DISCIPLINE. See ASSOCIATION OF IDEAS, CHILD-STUDY, PSYCHOLOGY FOR TEACHERS. Consult *Principles of Psychology* by James.

Hack′ensack, city and county-seat of Bergen County, New Jersey, on Hackensack River, 16 miles from New York. It is a residential city, but manufactures silk, jewelry, wallpaper, brick and other things. It has a high school, a public library and all the adjuncts of a modern city. It has electric connection with New York and other nearby cities, and is served by the New York, S. & W. and Erie railways It was settled about 1640 by the Dutch. Population 20,000

Had′dock, an important food-fish of the North Atlantic, resembling the cod in habits and appearance and belonging to the same family. The haddock is, however, to be readily distinguished from the cod by having a black lateral line on each side of the body, while that of the cod is white. The haddock does not reach the size of the largest cod; the average size caught weigh from three to four pounds, and the largest ones do not weigh over 17 pounds. They are found on the codfishing grounds, but are more limited in their range; swimming in large schools, they are more bunched together. Their eggs are very numerous, as is also the case with the cod; it has been estimated that there are nearly two million eggs in a single fish weighing ten pounds.


ARTHUR T. HADLEY

Had'ley, Arthur Twining, American economist and president of Yale University, was born at New Haven, Conn., April 23, 1856, and educated at Yale, from which he graduated in 1876. He subsequently passed two years at the University of Berlin, studying history and political and economic science. Returning to the United States, he became tutor and lecturer at Yale, being at the same time interested in labor-problems and in the science of railroad-transportation, on which he became an authority. In 1899, being at the time professor of political science in the graduate department of Yale, he was elected president of the University. He also became president of the American Economists' Association, and, in addition to a series of articles on transportation in Lalor's *Cyclopædia of Political Science*, he has published *Railway Transportation; Economics;* and a history of Yale in *Four American Universities.*

Ha'drian, Publius Ælius Hadrianus, Roman emperor from 117 to 138 A. D. He was born at Rome in 76 A. D., and in early life was under the patronage of Trajan, who was his kinsman. He filled several high offices in the state, and served with distinction in both the Dacian campaigns; and on the return of Trajan to Italy was left as prefect of Syria and commander of the legions which had conquered the Parthian empire. Trajan having died in Cilicia on his journey home, Hadrian was proclaimed emperor by the army. The empire was in a critical state. There were insurrections in Egypt, Palestine and Syria, the warlike Parthians had again asserted their independence, while the provinces were suffering from barbarian attacks. Hadrian wisely decided upon a policy of conciliation. He surrendered to the Parthians all the country beyond the Euphrates, appeased the barbarians who had invaded the frontier provinces, strengthened himself at Rome by lightening the burdens of the people, while he punished with severity a conspiracy of certain nobles against his life. In 119 he left Rome and made a tour of the empire for the purpose of learning the needs of all the provinces. He is said to have made this journey chiefly on foot, marching bareheaded, often 20 miles a day, and cheerfully sharing the hard fare of the humblest soldier. He visited Gaul, Germany and Britain, where he built the famous wall from the Solway to the Tyne. Returning, he visited Spain, Egypt, Asia Minor and Greece, reaching Rome after his circuit of the empire in 126 or 127 A. D. Later, he again visited the eastern provinces, spending two years in Athens, which he adorned with splendid and costly buildings. After crushing a great rebellion of the Jews, which broke out in 131 and lasted for several years, he returned to Italy and lived at Rome. During the painful illness of which he died in 138, he was guilty of violent outbursts of cruelty, which cast a shadow on the luster of his early reign.

Hæckel (*hăk'ĕl*), **Ernst Heinrich,** one of the ablest German naturalists, was born at Potsdam, Feb. 16, 1834. He studied medicine and allied sciences at Würzburg, Berlin and Vienna, and in 1865 became professor of zoology at the University of Jena, a position held until his death in 1919. He traveled very extensively, made many original invesigations and wrote important works on zoology and other subjects. He was the most aggressive representative of the evoluitionary ideas as to man's origin. With less poise and more impulsiveness than Huxley, he became the popular exponent in Germany, as Huxley was in England, of biological discoveries. His *Riddle of the Universe*, *Monism* and *The Last Link* represent his point of view on many subjects of deep interest. Among his best-known works are *The History of Creation* and *Evolution of Man.* Hæckel founded the gastræa theory, to the effect that the common ancestor of higher animals was a gastrula or animal whose body consists of a two-cell-layered sac, the opening being the mouth and the interior the stomach. His other important works are *Origin and Development of the Human Race; General Morphology; A Visit to Ceylon; Confessions of Faith of a Man of Science;* and several monographs on insect, shell and other minute life.

Hafiz (*hä'fiz*),**Mohammed Shamsuddin** or **Shems-ed-Din** (*i. e.*, Son of the Faith), better known by his poetical name of Hafiz, is conceded to be the greatest of Persian lyrical poets. He was also eminent as a teacher of theology and mystic philosophy, but it was his poetic genius which gained for him a world-wide fame. The date of his birth is unknown, but he is said to have died at a ripe old age in 1388 A. D. See English translations of some of the *Odes* by Love, Bichnell and Robinson.

Hafnium, element No. 72 in the chemist's Periodic Table, resembling zirconium, isolated in 1923 by D. Coster, a Dane, and George von Hevesy, a Hungarian, at Copenhagen. The Latin term for Copenhagan is *Hafnium,* hence the name.

Ha'gerstown, Md., county-seat of Washington County, 20 miles north of Harper's Ferry, in northwestern Maryland, is situated on Antietam Creek, six miles from the Potomac River and Chesapeake & Ohio Canal. Four railways and a trolley line pass through the city. It is a well-established region, peopled by well-to-do citizens, largely of German descent, and has a number of fine buildings including a library, a fine hospital and a city hall. It manufactures furniture, silk, cotton, flour, fertilizer, pipe-organs, brass, foundry products, automobiles, caskets, agricultural implements, machinery, cigars, doors, etc. Population 32,000.

HENRY RIDER HAGGARD

Hag'gard Henry Rider, an English novelist of note, was born June 22, 1856, at Bradenham Hall, Norfolk. He was educated at Ipswich, and in 1875 went as private secretary of Sir Henry Bulwer to Natal, South Africa. Later, he was private secretary to Sir T. Shepstone, commissioner to the Transvaal, and still later was made master of the high court of the Transvaal. In 1879 he returned to England and began his literary career. In 1882 *Cetewayo and His White Neighbors* was published, and in 1884 his first novel, *Dawn,* appeared, and *The Witch's Head* in 1885. The publication of *King Solomon's Mines,* 1886, gave him wide celebrity, and this was followed by *She* and *Jess* in 1887. Among his later novels may be mentioned *Allan Quatermain, Cleopatra, Ayesha* and *The Heart of the World.* He was, while he followed his peculiar vein, regarded as a master of the weird and fantastic in fiction. Of recent years he has taken a deep interest in all rural problems, and has written *Rural England,* a standard work upon English agriculture, and *The Poor and the Land.* In 1905 he visited the United States, as a British government commissioner, for the purpose of investigating the problems of land-settlement and labor-colonies. His death occurred in 1925.

Ha'ggart, Hon. John G.—born in Perth, Ontario, 1836. Elected to the House of Commons in 1872 and re-elected at each election since. Became postmaster-general in the Macdonald government in 1888. Became minister of railways in 1892 in the Abbott ministry. Held the same portfolio in the Thompson, Bowell and Tupper administrations. Resigned in 1896. Still a member of the House of Commons.

Hague (*hāg*) **Peace Conference,** a body of delegates or representatives of the various civilized nations who first met at the Hague, Holland, on the suggestion of the Emperor of Russia, in May 1899, to consider means for the mitigation of the horrors of war and the substitution of arbitration for war as a means of settling international disputes. Twenty-six of the states of the world were represented. Russia's proposals for compulsory arbitration and the reduction of existing armaments were not adopted. The scheme of arbitration finally agreed upon was voluntary in its plan, and was supported mainly by England and the United States. At the conference held in 1907, forty-six powers, including delegates from Latin America, were represented. Obligatory arbitration and a standing court were urged by thirty-nine nations, including England, France and the United States. It was opposed by Germany, Austria and Italy, among others, and was not adopted. The most important results were the establishment of a prize court; the extension of the Geneva Convention to sea warfare; the prohibition of the collection of public debts by force until after arbitration shall have been refused or an arbitral award disregarded; prohibition of the launching of projectiles and explosives from balloons; the use of projectiles, the only object of which is the diffusion of asphyxiating or deleterious gases; and the use of bullets which expand or flatten easily in the human body. It was also agreed that territory of neutral powers is inviolable; and that a neutral power resisting, even by force, attempts to violate its neutrality cannot be regarded as committing a hostile act. These clauses were proposed by the German Emperor at the conference of 1907. Great Britain and the United States alone ratified the agreement not to discharge projectiles or explosives from aircraft. At the third National Peace Conference in 1911, a resolution was adopted, introduced by James Speyer, a prominent New York banker, that war loans by the bankers of neutral nations be prohibited. Nothing in the Hague treaty calls for active intervention of the signatory powers in case of a violation.

Commenting on the Hague Conference and the peace movement in general, an eminent English authority on international law, Sir Thomas Barclay, observes that while experience has not confirmed the expectation that arbitration might supplant war, the number of possible cases of conflict have been reduced, and cases already tried by the Hague Court have removed causes of friction which might have been fanned into greater importance by the difficulties of settlement.

Hague, The, the official capital of the Netherlands, situated in the province of South Holland. It lies within three miles of the North Sea and about 34 southwest of Amsterdam. It is the handsomest, most fashionable and most modern-looking city in the Netherlands, and has been described as half-Dutch and half-French. It is the seat of the government, of both chambers of the states-general and of other tribunals and public offices, in one of which the state-papers have been preserved for four hundred years. The most important public institutions are the royal library, with over 200,000 volumes; the picture-gallery, with a splendid collection of works by native painters; the town-museum of antiquities and modern art; the royal school of design and music; the town-hall; and the royal palaces. It was here, in 1899 and 1907, that the Czar's International Peace Conferences met. Population 370,000.

Hahnemann (*hä'ne-män*), **Christian Friedrich, Samuel,** physician and founder of the homoeopathic school of medicine, was born at Meissen, in Saxony, April 10, 1755. After much study and many experiments he became convinced that the cure for a disease is the very drug which would in a healthy person produce symptoms of such a disease. Further experiments convinced him that the usual doses produced symptoms much too violent. This led him to consider another principle—that of small doses; and these are the two underlying principles of the system of medical practice known as "homeopathy."

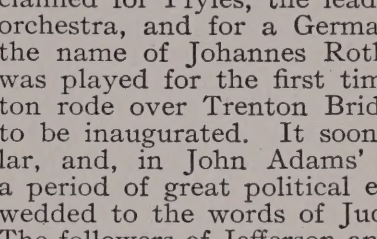
Haig, General Sir Douglas, commander-in-chief of the British forces in France in the European War. In doggedness of purpose, General Haig is a soldier of the Grant type. With this he combines a very scholarly mind. A graduate of Oxford and the best student at Sandhurst, he carries his scholarly habits into the field. The attack on Messines Ridge was in preparation for eighteen months. He studied the weather records for the previous twenty years and his knowledge of the topography of the region of France in which he fought took in every hillock and hole. His manners are those of a cultured, modest gentleman, and his appreciation of the men in the ranks is boundless. Of his men he says, "They are always wonderful." Born June 19, 1861, he served with distinction in many hard campaigns, including that of the Soudan (*v.* "Chinese" Gordon), fought under French in South Africa and in the immortal retreat to the Marne and later succeeded him as commander-in-chief of the British forces. At the outbreak of the war, he was in command at Aldershot, England's great training camp.

Hail, globules of ice of various sizes, which fall in the atmosphere after the manner of rain. The phenomenon is observed only in hot weather and generally during the daytime. Hail-storms last seldom more than a few minutes. If a hail-stone be cut in two, it will be found to be built up mostly of concentric layers of ice. The explanation of this structure and of hail-storms in general is imperfectly understood; but it appears highly probable that they are brought about by a cyclone or tornado having an axis parallel to the surface of the earth. The motion of the atmosphere about this axis may be so rapid as to carry raindrops from the lower and warmer to the upper and colder regions. In the higher regions the water becomes frozen, and at every round trip takes on a new coat of ice, thus accounting for the concentric layers.

Hail Columbia. Popular American national song. Words by Judge Hopkinson to a tune known as *The President's March.* The authorship of this march has been claimed for Pfyles, the leader of a theater orchestra, and for a German musician by the name of Johannes Roth. The march was played for the first time as Washington rode over Trenton Bridge on his way to be inaugurated. It soon became popular, and, in John Adams' presidency, at a period of great political excitement, was wedded to the words of Judge Hopkinson. The followers of Jefferson and Madison naturally derided the song, which nevertheless became a national song, regarded as one of the most stirring of its class. The crudities of the earliest version have largely disappeared in the one now in common use.

Hai'leybury. An important town on the shore of Lake Temiskaming and on the line of the Temiskaming Railway. In the midst of a rich mining-district, and adjacent to a first-class agricultural settlement. See TEMISKAMING.

Hair, a growth from the outer layer of cells in mammals affording a protection and known as fur, hair etc. It corresponds to feathers and scales, and may form a dense covering for the entire body, except the soles of the fore and hind feet, or may be confined to special regions. Hair grows sparsely on nearly all parts of the human body except the palms and soles. Hair grows from a tubular pocket or follicle which is produced by a sinking-in of the skin. At the bottom of the pouch is a rounded heap or cluster of cells containing a knot of blood-vessels; this is called the hair-papilla, and from it the hair grows and is nourished. The follicle is provided with oil-glands that keep the hair soft.



HAIRS OF VARIOUS ANIMALS MAGNIFIED

(a)Indian bat; (b)mouse; (c)sable; (d) human

The hairs are flexible, horny threads; the part which projects beyond the surface of the skin is called the shaft; the portion imbedded within the skin is the root, which at its lower extremity is expanded into a hollow knob called the hair-bulb; this fits over the hair-papilla. The hairs are inserted obliquely into the skin and the follicles are connected with small muscles, also obliquely placed, the contraction of which under the influence of cold, fear or other causes raises the hair. The shaft is composed of an outer layer, a middle layer of modified cells and a central core with minute air-cavities. As the hair grows from the bulb, the outer cells lose their protoplasm and become flattened scales; under the microscope the hair shows wavy lines where these scale-like remnants of cells fit together. The individual hairs have a certain length of life, and are shed and replaced. The human hair is not shed periodically, but a constant shedding and replacement is going on as regards hairs of the scalp and the beard. The color of hair is due to coloring matter or pigment, and is modified by the air-vesicles contained within the shaft. The cut end of straight hair is circular in outline and that of curly hair is elliptical. Different kinds of hair can be distinguished both by texture and by microscopic examination. The hairs of the sloth, mink, seal, sheep or goat have each a different feel and a different appearance under the microscope. The causes of loss of hair or baldness are various and imperfectly understood; it is supposed to be due to contraction of the mouth of the hair-follicle and insufficient nutrition to the hair; these conditions are doubtless influenced by the presence of bacteria. The theory of hair-restoration is to remove the bacteria, expand the mouth of the hair follicle and stimulate the hair-papilla to new growth.

Hairs (in plants), outgrowths from the epidermis. A hair may consist of a single elongated cell or of numerous cells, sometimes branching profusely, as in the common mullein. Sometimes it ends in a knob, consisting of a single cell or a group of cells called a gland, which has the power of excreting a sticky substance, giving the plant a clammy feeling. Such gland-bearing hairs are called glandular hairs and are possessed by many plants. The hairy coverings of plants serve a variety of purposes, helping them to resist cold, drouth, intense sunlight, undue wetting etc.

Ha'kla. See HECLA.

Haiti (*hā-tĭ*) or **Hayti** (mountainous country), called by Columbus Hispaniola, formerly a French colony but now an independent republic, occupies the western portion of the island of San Domingo, between Cuba and Porto Rico, which, next to Cuba, is the largest of the West Indian islands. The area of the republic is about 10,204 square miles, with a population of a little over two millions, chiefly negroes and mulattoes. The island is traversed by many ranges, but the valleys are green and fertile. There are no active volcanoes on the island, but earthquakes are frequent.

Government and Exports. The republic has a president at its head, and a senate, house of representatives and four heads of departments. Its exports are mainly coffee, cocoa, logwood, mahogany and cotton; of its imports about two thirds come from the United States.

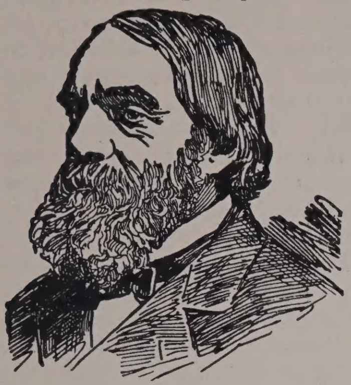
Cities. The capital, Port-au-Prince, has a population of about 100,000 mostly colored. The other towns and their populations are Cape Haitien (30,000), Les Cayes (12,000), Gonaives (13,000) and Port de Paix (about 10,000). The language of the people is mostly a debased (Creole) French, the religion being chiefly Roman Catholicism.

History. Haiti was discovered by Columbus in 1492. A few years after the discovery of the island, its inhabitants were wiped out by the cruelties of the Spaniards, and their places filled by negro slaves as early as 1505. Then the settlement of the buccaneers on the island of Tortugas caused the western part to be ceded to France in 1697. In 1797 began the internal wars between the whites, blacks and mixed races, besides the revolt against France and French rule. Touissaint L' Ouverture, a negro who until he was 40 years old had been a slave, was the hero of the struggle and proved himself a statesman. In 1801 France attempted to regain Haiti, but in 1804 Dessalines proclaimed himself emperor of Hayti. In 1825 the Dominican republic, formed by the union of French and Spanish Haiti, was recognized by France. General Hippolyte became president in 1889, who has since been succeeded by General Tiresias Simon Sam (elected 1896) and later by General Nord Alexis. Several lines of steamers (German, French and Dutch), connect the ports of Haiti with New York and with Hamburg and other European ports. There is a railway from Cape Haiti to Grande River (15 miles), whence a line is to be constructed to Port-au-Prince. From this port is another line to Lake Assuei, which is 28 miles in length and is to connect the capitals of Haiti and the Dominican Republic. See SANTO DOMINGO and *Hayti or the Black Republic* by St. John.

Hakluyt (*hăk'lo͞ot*), **Richard,** a distinguished English geographer, born about 1553 and died 1616. He was educated at Oxford and there became famous as a lecturer on the science of cosmography. In 1589 he published his great work *The Principal Navigations, Voyages and Discoveries of the English Nation. Made by*

Sea or Land Within the Compass of these 1,500 Years. This work is considered of such lasting value that an edition was published in 1885-90.

Hale, Edward Everett, was born at Boston, Mass., April 3, 1822, graduated at Harvard in 1839, and ordained a Congregational minister in 1842. In 1856 he was called to the South Congregational (Unitarian) Church in Boston. His influence in benevolent movements has been widespread. His book, *Ten Times One Is Ten* (1870) originated in the United States a series of clubs called Lend a Hand, and some with other names, which have branches in Europe, Asia, Africa and the Pacific island. The society of The King's Daughters also owes its beginning to Dr. Hale. The motto of these clubs is: "Look up and not down; look forward and not back; look out and not in; and lend a hand." Dr. Hale has edited religious and other journals, Lingard's *History of England* and original documents from the British state-papers and the British Museum, relating to the founding of Virginia. He was long the chaplain of the United States Senate, His published books, mostly stories, number nearly 50, the best known of which are *The Man without a Country, In His Name, Ten Times One Is Ten* and *Philip Nolan's Friends;* together with the *Story of Massachusetts, Lowell and his Friends* and *Memoirs of a Hundred Years. The Man without a Country* has become an American classic of world fame. Everett died in 1909.


EDWARD EVERETT HALE

Hale, John Parker, American statesman, was born at Rochester, N. H., March 31, 1806, and died at Dover, N. H., Nov. 19, 1873. After graduating at Bowdoin College, he studied law and in 1830 was admitted to the bar of his state. In 1842 he was elected to congress, after which he sat in the United States senate from 1847 to 1853 and from 1855 to 1865. In the interval he was candidate of the Free Soil party for the presidency, but was defeated by Pierce. He was a born orator, and possessed no little humor and pathos. From 1865 to 1869 he held the post of United States minister to Spain. In his later years he was affected by paralysis, which for several years before his death impaired his mental and physical faculties.

Hale, Nathan, was an American soldier in the Revolutionary army, who rose to the rank of captain. He was born at Coventry, Conn., June 6, 1755. Having volunteered to penetrate the British lines and procure information for Washington, he was detected and executed as a spy in New York city, Sept. 22, 1776. See *The Two Spies, Nathan Hale and John André,* by Lossing.

Half-Tone, a process by which reproductions of photographs, engravings and wash-drawings are made on copper or zinc plates for printing. A photographic negative of the picture to be reproduced is made through a screen consisting of two glass-plates which have been prepared as follows: Each glass-plate is coated with a prepared varnish, then ruled at an angle of 45° with a diamond-pointed cutter, the parallel lines being of any fineness desired. It is then treated with an acid which eats or etches the exposed lines, which are then filled with an opaque pigment and baked in an oven. The glass is then polished smooth, leaving the clear glass transparent. The two, ruled glass-plates are placed together, so that the lines cross at right angles, and are cemented with Canada balsam. This screen is placed in the camera in front of the sensitive plate, and the image is thus broken into dots and the light and shade of the original are preserved. A sensitized plate — generally of copper — is exposed under the half-tone negative, the plate is then given a cold-water bath, and the parts of the coating not printed on are washed out. The picture remaining upon the plate is hardened by a baking process, and is then etched; the plate is carefully finished and mounted on a wood block type high and is ready for the printing-press.

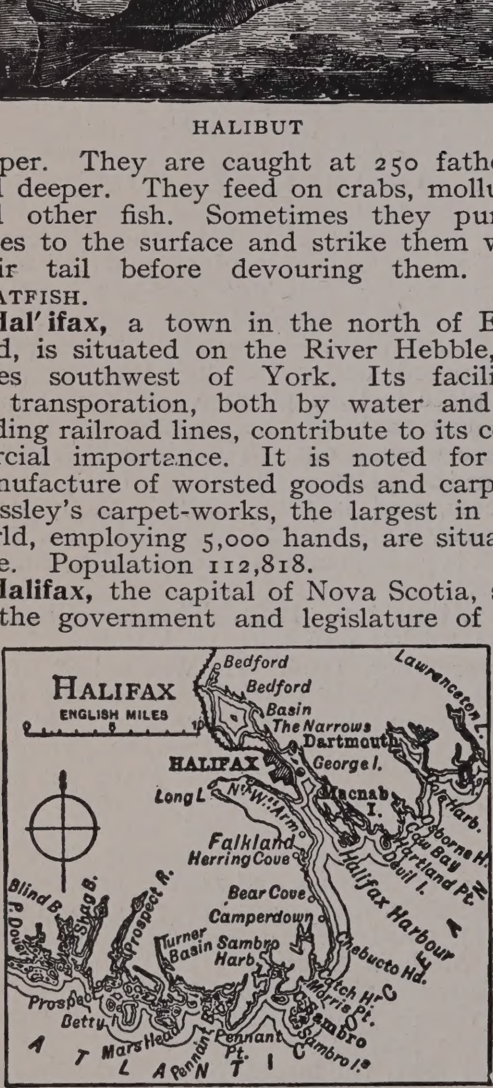
Hal′ibur′ton, Hon. Thomas Chandler (Sam Slick), was born at Windsor, N. S., in December, 1796. He was called to the bar and became chief justice of the court of common pleas of Nova Scotia in 1828 and of the supreme court in 1840, resigning and going to England in 1856, where he died, near Isleworth, Aug. 27, 1867. He is still remembered for his humorous and historical writings, which include *The Clockmaker: or Sayings and Doings of Sam Slick of Slickville,* first series (1837), second series (1838), third series (1840); *The Attaché: or Sam Slick in England* (1843); *The Bubbles of Canada* (1839); *The Old Judge: or Life in a Colony* (1843), in addition to a *History of Nova Scotia.*

Hal′ibut, the largest of the flat fishes and the most important as a food-supply. They are more elongated in form than the other flat fishes and reach a larger size. They are dark above and whitish below. The average full-grown male weighs about 50 pounds, but the female is larger and an average weight is from 100 to 150 pounds. Besides these average sizes, exceptional sizes are recorded running up to six hundred pounds; one weighing 350 pounds is seven or eight feet long and four feet wide. The smaller ones weighing 10 or 20 pounds are called chicken-halibut. They are the best for eating, and bring the highest price per pound. The halibut has about the same geographical range as the cod, but shows a preference for cold water and goes deeper. They are caught at 250 fathoms and deeper. They feed on crabs, mollusks and other fish. Sometimes they pursue fishes to the surface and strike them with their tail before devouring them. See FLATFISH.

HALIBUT

Hal′ifax, a town in the north of England, is situated on the River Hebble, 43 miles southwest of York. Its facilities for transporation, both by water and by leading railroad lines, contribute to its commercial importance. It is noted for its manufacture of worsted goods and carpets. Crossley's carpet-works, the largest in the world, employing 5,000 hands, are situated here. Population 112,818.

Halifax, the capital of Nova Scotia, seat of the government and legislature of the province and the chief Atlantic seaport of Canada, is situated on the eastern coast of Nova Scotia. Its harbor, called by the Indians Chebucto, meaning the greatest of havens, is one of the finest in the world. It was until 1906 the principal naval and military station of Great Britain in America (now garrisoned by the Canadian government-troops), and is strongly fortified. It also has considerable commercial importance, and is the seat of Dalhousie University and a large number of other educational institutions. It is the eastern terminus of the Intercolonial and Dominion Atlantic Railroads, and has lines of steamers to Liverpool, New York and Boston. On Dec. 6, 1917, an explosion of munitions due to a collision in the harbor, destroyed 1,266 lives and 2,000 buildings. Population 40,832.



Hall, Granville Stanley, educator, psychologist and author, was born in 1846 at Ashfield, Mass. He received the degree of A. B. from Williams College in 1867, A. M. in 1870, and was graduated from Union Theological Seminary in 1871. In 1878 he received his Ph. D. degree from Harvard. He has spent several years in study at various universities in Germany. He was professor of philosophy at Antioch College (Ohio), 1872-76, lecturer in English at Harvard and in the history of philosophy at Williams, and professor of psychology and pedagogy in Johns Hopkins University, 1881-88. Since 1889 he has been president of Clark University, Worcester, Mass., and professor of psychology. He is well-known as the editor of the *American Journal of Psychology* and the *Pedagogical Seminary* and as the author of *Adolescence.* He has done much to promote research in psychology, and is recognized as one of America's leading educators.

Hall, Robert, a celebrated English preacher and writer, was born at Arnsby, May 2, 1764. Feeble in body but bright in intellect, he learned to read before he could talk. He was educated at a Baptist academy in Bristol and at King's College, Aberdeen, where his eloquent preaching drew great crowds to hear him. In 1790 he went to Cambridge, where he rose to the highest rank of British pulpit-orators. Besides his published sermons, his more important writings are *An Apology for the Freedom of the Press* and *On Terms of Communion.* See *Life* by Gregory and *Observations on His Preaching* by Foster, in the published edition of his works. He died on Feb. 21, 1831.

Hallam (*hăl′am*), **Henry,** an English historian, was born at Windsor, July 9, 1777. He was educated at Oxford, and read law in Lincoln's Inn, but from the first gave himself entirely to literary pursuits. His first great work, his *View of Europe in the Middle Ages,* was published in 1818. It at once gave him a foremost place among English historians. In 1827 he published *The Constitutional History of England* and in 1837–39 his *Introduction to the Literature of Europe in the Fifteenth, Sixteenth and Seventeenth Centuries.* Upon these three great works rests his position as an historian. He died in 1859. His son, Arthur Henry Hallam, who died at 23, is subject of Tennyson's *In Memoriam.*

Halle (*häl'ē*), a city of Prussian Saxony, is situated on the right bank of the Saale and on several small islands of the river, twenty miles northwest of Leipsic. It is called *Halle an der saale* locally to distinguish it from other towns of the same name in Germany. There are many interesting medieval buildings in the city. A statue in bronze of Handel, who was born in Halle, stands in the old market place. Among the buildings of fame are St. Mary's Church, built in 1529 to 1554; and a Gothic Church of St. Maurice, with a red tower 276 feet high, faced by a statue of Roland. This church dates from the fourteenth century. The university at Halle is also famed, having been founded in 1694 by Frederick I of Prussia. Napoleon suppressed it in 1806 and in 1813, but it was reopened in 1815 and united with the University of Wittenberg. In 1931, this university had an enrollment of 2,551 and a faculty of 238. Halle is an important railroad center and has rapidly increased in size and prosperity. The chief industry is the production of salt, obtained from the salt springs near and within the city, which have been worked from the seventh century. The men employed there are known as Halloren, and are a distinct group, with many ancient traditions and peculiar characteristics. Other industries include machine-making, sugar-refining, printing, brewing, manufacture of mineral oil, and the production of fruits. In 1930, the population of Halle was 194,635.

Halleck (*hăl'ĕk*), **Fitz-Greene**, an American poet was born at Guilford, Connecticut, on July 8, 1790. By his mother he was descended from John Eliot, "the Apostle of the Indians." He was a bank clerk in New York, and in 1832 became the private secretary of John Jacob Astor, who left him an annuity on which he retired to his native town in 1849. He began to write at an early age, and in 1819 he contributed, with Joseph Rodman Drake, a series of papers in verse to the New York *Evening Post*. In the same year he published his longest poem, *Fanny*, a satire on the literature, fashions and politics of the time. His famous poem, *Marco Bozzaris*, and the beautiful tribute to Burns appeared in 1822. He published a collection of his poems in 1827 and an enlarged edition in 1845. In 1865 he published his poem, *Young America*. He died in 1867.

Halleck, Henry Wager, an American general, was born at Westernville, New York, on January 16, 1815, and was graduated at West Point in 1839. He served in the Mexican War, and was brevetted captain for gallant services in 1847. He became captain of engineers in 1853, left the service in 1854, and for some time practiced law in San Francisco. At the beginning of the Civil War he was commissioned major-general in the regular army, and in November, 1861, was appointed commander of the department of the Missouri. In March, 1862, his command was enlarged to embrace the Mississippi valley, and after the battle of Shiloh he took personal command of the army operating against Corinth. In July he was made general-in-chief of all the Federal armies, with headquarters at Washington, from which point he directed the operations of the generals in the field until March, 1864, when he was superseded by General Grant. He was chief of staff until 1865. He remained in the regular army for the rest of his life. He commanded the military division of the Pacific until 1869, and had command of the division of the South from then until his death in 1872. He was the author of *Elements of Military Art and Science* (1846).

Halley, Edmund, an English astronomer and mathematician, was born at Haggerston, near London, in 1656, the son of a wealthy soap-boiler. He was educated at St. Paul's School and Queen's College, Oxford. He is considered to have been a mathematical genius. When a very young lad he noticed the variation of the compass, and at the age of nineteen he computed the orbits of the planets. In 1676, he published a paper on the subject, also opinions as to the sun's rotation on its axis, which he had reached from observations of a spot on the sun. Halley felt that astronomy could not make progress until the position of the fixed stars was more accurately determined. As others were working on the northern hemisphere, he prepared a catalogue of the 360 visible stars in the southern hemisphere, receiving the name of "Southern Tycho" for this service.

In 1680, while at Paris, he worked with Cassini observing the great comet which has been named for him, and whose return he predicted. On his return to England, he published in 1683 his theory of the variation of the magnet. From residence at St. Helena, he decided that the standard pendulum loses time when carried toward the equator, as the London pendulum was too long for St. Helena. In 1684 he became acquainted with Newton, whom he encouraged to publish his *Principia*, Newton's great work on astronomy. In 1688, he made a long ocean voyage to test his theory of the magnetic variation of the compass, publishing the results of these observations in a chart in 1701. He made valuable experiments with the diving-bell. He held various positions during these years of study, the most important being those of director of the mint, professor of geometry at Oxford, and astronomer royal at Greenwich.

Halley's chief work of importance to us to-day was in relation to what is known as "Halley's Comet." He began to compute the orbits of the comets which had appeared in the two centuries between 1480 and 1680. He announced the discovery that comets follow regular orbits which result in a regular return, their invisibility during much of the time being due to the fact that they are too far away to be seen. Halley laid out the path of Halley's Comet, which passed within 11,000,000 miles of the sun in 1682. He announced that it was the identical comet which had aroused terror in 1607, and that it would return in 1758. He made the statement: "And when it really appears, do not forget that it was an Englishman who made the first prediction of the return of any comet." Halley died in 1742, sixteen years before the time he set for the return of the comet, but it was visible on December 5, 1758, true to his prediction. It appeared again in 1835, and in 1909, at which time interest in Halley was revived. The comet is visible to the eye for a few weeks, and to the telescope for only a few months. It requires 78.8 years for Halley's comet to complete a revolution in its orbit.

Halliburton, Richard, an American traveller and author, was born at Brownsville, Tennessee, on January 9, 1900. He was a son of Wesley and Nell Nance Halliburton. Young Richard was graduated from the Lawrenceville, New Jersey schools in 1917, and received his A.B. degree from Princeton University in 1921. He had from childhood a great wanderlust, and began to satisfy his cravings immediately after graduation. Since that time, he has devoted himself to visiting places of historical and even mythological fame, and recording his experiences in charming informal books of travel. Halliburton has taken great delight in feats which had previously been considered impossible, or at least, most difficult of accomplishment.

He climbed the Matterhorn in October, 1921. In midwinter of January, 1923, he established a record in the first singlehanded conquest of Fujiyama at that season. On the trail of the gods, he climbed Mt. Olympus in 1925, and Mt. Etna in December of that same year, having swam the Hellespont in August, in emulation of Leander. These accomplishments were in connection with his Homeric expedition, in whch he traced the travels of Ulysses from Ithaca to Troy and his return home, as recorded in the *Odyssey*. In 1928, Halliburton mapped and traced on foot the cônquest of Mexico by Cortez, and the march of Balboa across Darien which resulted in the sight of the Pacific Ocean. This expedition included the swimming of the Panama Canal from the Atlantic Ocean to the Pacific. Having accomplished this, he explored the Yucatan, Peru, and western Brazil, and climbed Popocatapetl in the same year.

Halliburton was insatiable. Walking and swimming could not quickly enough satisfy his yearning to see the world. Consequently in 1931 to 1932, he travelled over 50,000 miles by aeroplane. This included a journey from Algiers to Timbuctoo and back; tracing the route of the First Crusade; a journey from Paris to Jerusalem; tracing the route of Alexander the Great, and exploration of New Guinea, Borneo and the Southern Seas. In the course of his travels, he took time to swim the beautiful blue Sea of Galilee in October, 1931.

His style as an author is informal and racy. There is real literary quality to his works. The subject matter is fascinating, as Halliburton has traced routes of such deep interest, and yet found time for audacious exploits such as sleeping all night in the garden of the Taj Mahal, and photographing forbidden defenses. His first work has been one of the most popular, perhaps because of its novelty to a world jaded with the usual type of travel material. His works include: *The Royal Road to Romance* (1925); *The Glorious Adventure* (1927); *New Worlds to Conquer* (1929); *The Flying Carpet* (1932), and *India Speaks, with Richard Halliburton* (1933).

Hallock, Gerard, an American journalist, was born in Plainfield, Massachusetts, in 1800. He early began a journalistic career. Hallock founded the *Boston Recorder* and shared the ownership of the *New York Observor.* In 1828, with David Hale he became joint manager of the *Journal of Commerce.* The partners used methods which were then startling, to gain news. They sent a vessel to patrol the seas around Sandy Hook, meet incoming vessels and from them obtain news from Europe in particular. In 1833 they began an express line with horse relays, from Philadelphia to New York City. These innovations enabled them to secure news from Europe, and report acts of Congress, a day ahead of other newspapers. In 1861, because of its support of the South, the *Journal of Commerce* with four other papers similarly indicted was forbidden the use of the mails. Within a short time after, Hallock sold his interest in the paper and retired to private life. He died in 1866.

Hall of Fame, a memorial building at Munich, Bavaria, erected in 1853. The structure has a Doric portico on a high basement of masonry. There are projecting wings. The center is occupied by a colossal statue of Bavaria in bronze, sixty-two feet high. The State is symbolized by the figure of a woman, holding a wreath high in her left hand. Crouched at her side is the lion of Bavaria. Within this beautiful memorial, ranged about the portico, are the busts of eighty celebrated Bavarians, considered worthy of a place in the Hall of Fame of their country.

Hall of Fame, American, also called **Hall of Fame for Great Americans**, is a colonnade 500 feet in length on one of the University terraces at University Heights in New York City. Dr. Henry Mitchell MacCracken, Chancellor of New York University in 1900, accepted a gift of $100,000 from Mrs. F. J. Shepard (Helen Gould) for the erection of this Hall of Fame. The gift was afterward increased to $250,000. The magnificent site overlooking the Hudson Valley and Harlem was chosen for the colonnade which connects the Hall of Philosophy and the Hall of Languages. There are 150 panels two feet by eight in size, on which are to be inscribed bronze tablets bearing the names and the dates of birth and death of the chosen native Americans. There are also five rooms for portraits and mementos of these distinguished citizens. It has become the custom to secure busts of these members of the Hall of Fame, and pedestals also, through cooperating associations or individuals, for inclusion in the Hall of Fame. This has been done immediately following election in each instance.

One of the first requirements for eligibility to the Hall of Fame is that the proposed candidate must have been born a citizen of the United States and have been dead ten years. Nominations are made by the public and submitted to a committee of 100 eminent citizens. In election of men, fifty-one votes are required, and in the election of women, forty-seven. A recent rule has changed the original ten-year requirement so that at present a citizen must have been dead for twenty-five years to be eligible. Fifteen classes of citizens were recommended for the consideration of the committee.

In 1900, when the first choice was made, the donor decided that only fifty names might be chosen for inscriptions in that year, and five additional names every fifth year thereafter until the year 2,000, when the 150 inscriptions will have been completed. The University Senate, however, chose only twenty-nine in the first year of election. The names are chosen by a College of Electors, the 100 members of which are themselves men and women of distinction, representing every State in the Union, and several professions.

In this beautiful and dignified building have been inscribed the names and placed the busts of the following distinguished citizens of the United States, chosen in the designated years:

1900

George Washington
Abraham Lincoln
Daniel Webster
Robert E. Lee
Ulysses S. Grant
John Marshall
Thomas Jefferson
Ralph Waldo Emerson
Henry Wadsworth Longfellow
Robert Fulton
Washington Irving
Jonathan Edwards
Asa Gray
Samuel F. B. Morse
Henry Clay
Nathaniel Hawthorne
George Peabody
Benjamin Franklin
Peter Cooper
Eli Whitney
John James Audubon
Horace Mann
Henry Ward Beecher
James Kent
John Adams
Joseph Story
William Ellery Channing
Gilbert Stuart
David Glasgow Farragut

1905

James Russell Lowell
Mary Lyon
Emma Willard
Maria Mitchell
John Paul Jones (withdrawn)
John Greenleaf Whittier
James Madison
Louis Agassiz
William T. Sherman
Alexander Hamilton
John Quincy Adams

1910

Harriet Beecher Stowe
Oliver Wendell Holmes
James Fenimore Cooper
Phillips Brooks

1910

William Cullen Bryant
Edgar Allen Poe
Frances E. Willard
Andrew Jackson
George Bancroft
John Lothrop Motley

1915

Mark Hopkins
Francis Parkman
Elias Howe
Charlotte Cushman
Rufus Choate
Daniel Boone
Joseph Henry

1920

Patrick Henry
Mark Twain
Augustus Saint-Gaudens
William T. G. Morton
Alice Freeman Palmer
Roger Williams
James Buchanan Eads

1925

John Paul Jones (reëlected)
Edwin Booth

1930

Walt Whitman
James A. McNeil Whistler
Matthew Fontaine Maury
James Monroe

Hall of Fame, National, is to be found in Statuary Hall in the National Capitol building at Washington, D. C. In 1864 Congress passed a law which provided for a request to each state to send two statues, either in marble or bronze, of such deceased citizens as the State felt to be most worthy of commemoration in this manner. These statues were placed in Statuary Hall and became the Hall of Fame. There are sixty-four statues. Included among the members of this Hall are many who figured largely in the beginning history of the United States, such as Washington and Robert E. Lee from Virginia; Samuel Adams and John Winthrop from Massachusetts; Andrew Jackson from Tennessee; Roger Williams from Rhode Island; Ethan Allen from Vermont; Robert Fulton from Pennsylvania; Jefferson Davis from Mississippi; Alexander H. Stephens from Georgia; John C. Calhoun from South Carolina, and James A. Garfield from Ohio. The date of 1864, and the requirement that the citizens thus honored should be deceased, made the choices limited, and accounts for some notable absences in the ranks of the great of America. All of the inclusions, however, are worthy and important.

Hall of Fame, Ohio University, was established by the School of Journalism, for the commemoration of famed newspaper editors. The following were elected to inclusion in the Hall of Fame: Joseph Medill; Samuel Sullivan Cox; D. R. Locke; William Maxwell; Murat Halstead; William Dean Howells; Whitelaw Reid; Januarius Aloysius MacGahan; John T. Mack; Charles Hammond; Edward Wilson; Washington McLean; James W. Faulkner; Edward W. Scripps; Charles F. Browne; John Brough; Warren G.

Harding; Edward Cowles, and Samuel Medary.

Hall of Fame, University of Illinois, is a memorial hall in the auditorium, established by the Illinois Press Association in memory of distinguished Illinois newspaper editors. The Hall was dedicated on November 21, 1931, and busts unveiled to: Victor Fremont Lawson; Joseph M. Medill; Elijah P. Lovejoy; Henry W. Clendennin; David W. Barkley; Simeon Francis; William O. Davis; Melville E. Stone; John W. Clinton; John W. Bailey; Edward W. Scripps, and Henry M. Pindell. In January, 1931, five more names were added to the list, two of them being foreign journalists. In October of that same year nine more journalists of both national and international fame were honored in the university hall of fame.

Hallowe'en (*hăl-lō-ēn′*), the Eve of All Hallows or the Festival of All Saints, occurs on the night of the thirty-first of October as the festival occurs on November first. It was originally thought that evil spirits were abroad on this evening, and it was considered unsafe to go out alone, lest one of the mischievous or wicked spirits might be in the path. The belief in spirits has faded out, but the evening is set aside for the playing of pranks. In England and Scotland it was long the custom to gather around the fireside, and perform many ceremonies to discover the future wife or husband. Robert Burns has immortalized some of these customs in his poem entitled *Hallowe'en.* In this country, it is chiefly a time for boyish pranks and jokes. Hallowe'en parties are common, and masquerades. The ghost, the witch and black cat belong especially to Hallowe'en in this country, and apples, cider and pumpkin pie are traditional refreshments.

Hallucination (*hă-lū-sĭ-nā′shŭn*), the apparent perception of some external object without reality, or, in general, any belief or idea unfounded in fact. Hallucination is not illusion, which is a distortion of reality; nor delusion, in which the belief is fixed and unchangeable by the victim. An hallucination is purely imaginary yet so vivid and seemingly so real, that it stimulates actual perception, although the objective stimulus is lacking. The most common form of hallucination is auditory or visual, although they may also be within the fields of taste, smell and touch.

One of the most ordinary hallucinations is the hearing of voices or seeing of visions when one is drowsy, in the half-unconscious state preceding sleep. After a period of concentrated mental work, intellectuals are liable to hallucinations, especially if they are anemic or neurasthenic. Often hallucinations take the form of the apparition of a person who is dead or at a great distance from the subject.

The presence of hallucinations is usually an indication of a grave condition, if they are continued and persistent. It is believed probable, however, that most minds suffer from some form of hallucination at times. In certain forms of insanity, hallucinations are the only abnormal symptoms. All acute toxic states are accompanied by hallucinations. In dementia præcox, hallucination leads to the abnormal impulsive actions which are a marked characteristic of this disease. In paranoia, the delusions of persecution and of grandeur are built on hallucinations. They occur less commonly in mania, and are transitory and of an elemental nature. Sometimes they are aroused by physical causes, such as accumulations of wax in the ear, enlarged tonsils, catarrh or polypi in the nasal passages or decayed teeth. The action of drugs such as morphia or ether, and disturbances of brain nutrition, are also a cause of hallucinations. All of these physical causes seem to have a common factor in deposits of products of decomposition in the cerebral cortex which make the affected areas irritable and then act as stimuli to brain action.

Formerly, hallucinations were held to be the result of mental lack of balance. In England at one time there was an attempt to make hallucination a proof by law of insanity. However, it is now considered that only when there is utter lack of discrimination in judgment, and the will cannot keep hallucinations relegated to the background, is the subject in any sense mentally unbalanced. Hallucinations are a class of phenomena that have attracted psychical research. They are considered supernatural by some investigators, but others believe them to be a normal result of misjudgment which can be corrected by proper mental discipline and training.

Halo (*hā′lō*), a circle of luminous light, either white or prismatically colored, appearing to surround a luminous body. It is caused either by reflection or refraction of the light of the body it surrounds, sometimes by both. The term is generally used for the circles around the sun or moon which are caused by particles in the upper atmosphere. The halo or nimbus is familiar in art, having been used by the ancients particularly to surround the heads of the deities and sacred personages. Poets use the term for deities appearing to mortals, with heads crowned by halos. In Christian art the halo is used for the heads of Christ, the Virgin Mary, and the saints and martyrs. It is usually circular but often for Christ and the martyrs, is shown as luminous rays which form a cross.

Halophytes (*hăl′ō-fīts*), plants which grow in salt or alkaline soils. They are found in the vicinity of the seashore, on the margins of salt lakes, about saline springs and on certain arid wastes of the interior which probably were portions of old sea basins. A large area of the last kind is represented by the so-called bad lands of Nebraska and South Dakota. Few plants are able to endure such conditions, the family which has been best able to adapt itself to them being the goosefoot family to which belong such weedy plants as the sea blight, salt wort, and greasewood. Associated with these plants are certain spurges, sedges, grasses etc. Certain well-known families are never represented in halophyte conditions, as nettles, roses, heaths, mosses and lichens. Halophytes are mostly succulent plants, with thick and often translucent leaves. Prominent among halophyte societies are the mangrove swamps, which occur along flat, tropical seacoasts where the waters are quiet, the mangrove being a curious tree which advances slowly out into the water; beech marshes and meadows, with their growth of coarse grasses and sedges and occurring in large areas beyond the reach of ordinary flood tide; salt steppes, often occurring in large areas in the interior of continents, as in the Great Salt Lake basin, where the races of greasewoods etc. largely flourish; and salt and alkaline deserts, where the scanty water is saturated with salts and vegetation reaches its lowest ebb, as in the region of the Dead Sea and in Death Valley in southern California.

Hal′sted, Murat, an American editor and author, born in Butler County, O., Sept. 2, 1829. He was educated at Farmer's College. College Hill, O. In 1853 he became a reporter for the Cincinnati *Commercial*, and in the following year became part owner. In 1856 he became editor-in-chief, and in 1867 was proprietor. The *Commercial* and the *Gazette* were later consolidated, and he became chief editor of the *Commercial-Gazette* in 1882. A Republican in politics, he was a strong and independent editorial writer. In 1890 he became editor of the *Standard-Union*, Brooklyn, and in 1895–96 wrote letters for the press from Cuba. These were later the chief material for *The Story of Cuba*. He died on July 2d, 1908.

Ham′adan′. See Ecbatana.

Hamath (*hā′math*) or **Hamah,** a very ancient city of Syria on the Orontes, 110 miles north of Damascus. The population is about 42,000, and the people make coarse woolen mantles and yarn, trading chiefly with the Bedouins. Hamath was taken by the Assyrians in 854 B. C. and again in 743 B. C. In 639 A. D. it came into the power of the Moslems. In 1812 four stones were discovered there by Burckhardt, bearing inscriptions in an unknown language now believed to be Hittite

Hamburg (*hăm′bûrg*), a free city of Germany, is situated on the Elbe, about 75 miles from the German Ocean. It was founded by Charlemagne in 808. In 1189 Emperor Henry VI granted it a separate judicial system and freedom from customs-dues, and its commercial prosperity began. In 1241 it joined with Lübeck and Bremen in steps which resulted in the Hanseatic League. From that time it increased rapidly in wealth and population, and by purchase increased its territory, including the present harbor of Cuxhaven. It prospered specially during the Thirty Years' War (1618–48).

VIEW IN HAMBURG LOWER HARBOR

In 1806 Hamburg was occupied by the French, and this was the beginning of serious reverses. In 1810 it was annexed to the French Empire, and in 1814, when the French occupation ceased, it had lost its commerce and half its population. The next year it joined the German Confederation as one of the four free cities, and its prosperity rapidly revived. In 1842 one third of the city was destroyed by fire, but it was rapidly rebuilt in modern style. Hamburg is the busiest commercial city in Europe and the principal commercial seaport of Germany. Next to London, it has the largest money-exchange transactions in Europe. Hamburg is one of the greatest ports of embarkation for emigrants in Germany. In 1892 it was visited by the cholera, which destroyed thousands of lives and ruined for a time its enormous trade, so that it had to appeal for aid. Population 1,015,707.

PHILIP G. HAMERTON

Ham'erton, Philip Gilbert, an English writer on art, was born at Laneside in Lancashire, Sept. 10, 1834. He began his career as an art-critic by writing for the *Fine Arts Quarterly* and the *Fortnightly* and *Saturday Reviews.* In 1855 he published a poem on *The Isles of Loch Awe* and in 1862 *A Painter's Camp in the Highlands* and *Thoughts about Art.* From 1869 to 1889 he edited *The Portfolio,* an art-journal. Others of his works are *The Intellectual Life, The Graphic Arts, Human Intercourse, Landscape, Portfolio Papers* (1889) and a number of novels. He was a writer of keen discrimination, and had a picturesque and impressive style. He died at Boulogne, Nov. 6, 1894.

Hamilcar (*hȧ-mĭl'kär*), a Carthaginian general, the father of Hannibal and one of the greatest generals of ancient times. He was surnamed Barca or Lightning. While still a young man, he was placed in command of the Carthaginian forces in Sicily (247 B. C.), when almost all the island had been taken by the Romans. He seized Ercte, a hill 2,000 feet high, and from this stronghold as a base he ravaged the coast of Italy and for three years, with a small force, defied every effort of the Romans to dislodge him. In 244 B. C. he occupied Mt. Eryx, two miles from the coast, and for two years, with his handful of men, held his own against the Roman army, "fighting," says Polybius, "like a royal eagle, which stops only to gather strength for the next attack." The Carthaginian navy being defeated, 241 B. C., Sicily yielded to Rome, but Hamilcar marched out with all the honors of war. Immediately after peace had been made with Rome, a revolt of the mercenaries and African tribes threatened the overthrow of the state. Hanno, a personal enemy of Hamilcar, undertook to suppress it and failed. Hamilcar was then placed in command and crushed the revolt in 238 B. C. In the same year Rome again made war on Carthage, and Hamilcar was placed in command of the Carthaginian army. He now crossed into Spain, determined there to gather and drill an army capable of meeting the Roman legions, and then wage war on Roman soil. He entered Spain in 237 B. C., and in nine years built up a new empire; but in 228 B. C. he fell fighting the Vetones, leaving the plans of the great Hamilcar to be carried out by his greater son, Hannibal. See *Carthage and the Carthaginians* by Bosworth Smith.

Ham'ilton, Alexander, one of the greatest of American statesmen, was born on Jan. 11, 1757, in the West Indian island of Nevis. His father, a Scotch merchant, failed in business, and Alexander, when 12 years of age, entered the employ of a merchant at St. Croix. His marked abilities at the same time secured him the interest of friends, who sent him to a school at Elizabeth, N. J., and in 1774 he entered King's (now Columbia) College, New York. While at college and but 18 years old, he wrote a series of papers in defense of the colonies which were at first credited to the eminent statesman, John Jay, and at once brought him to the notice of the public. When the War of the Revolution began, Hamilton was made a captain of artillery, and in 1777 was appointed aid-de-camp by Washington and became his valued friend and adviser. In 1780 he married a daughter of General Schuyler. At the close of the war he studied law, and soon became one of the most eminent lawyers of New York. He was elected to Congress in 1782, and in 1787 was a leader in the convention at Philadelphia which framed the constitution of the United States. In October of the same year he began a series of articles explaining the scope and power of the constitution, which were published under the name of *The Federalist.* Of the 85 essays in the collection, 51 were written by Hamilton, and these deservedly gave him his widest fame. When Washington became president of the new government in 1789, he appointed Hamilton secretary of the treasury. Here his able management, which raised the public

ALEXANDER HAMILTON

credit from utter prostration to the highest point, gained for him the reputation of a great financier. In 1795 he resigned his office, but later was active in politics as a leader of the Federal party. In 1804, through a political difference, he was involved in a duel with Aaron Burr, in which he was mortally wounded, July 11, and died the next day. See *Lives* by Morse and by Lodge.

Hamilton, Gail. See DODGE, MARY ABIGAIL.

Hamilton, O., the county-seat of Butler County, is built on both sides of the Miami River. The city owns and operates its own gas and water works. It has thriving factories, which are operated by a system of hydraulics fed by the river, which is turned from its channel into an immense reservoir, while waterpower is also obtained from the canal. Many of these factories have been established in the past few years, and they produce paper, flour, woolen goods, agricultural implements, machinery, tools and iron. Four railroads connect the city with all parts of the country. The public schools occupy fine buildings and take high rank. Population 45,000

Hamilton, a city of Ontario, Canada, at the western end of Lake Ontario. It is handsomely situated, the residences extending up the slope of "The Mountain," at the foot of which the business portion lies. The streets are wide and shaded with trees, many of the houses and public buildings being among the finest in Canada. It is an important railroad-center, stands at the head of lake-navigation, and in manufacturing industries almost excels any other city in Canada. Population about 115,000.

Hamilton, Sir William, a metaphysician, the most acute logician and most learned philosopher of the Scottish school, was born in 1788 at Glasgow, where his father and grandfather in succession held the chairs of anatomy and botany. Having studied with distinction at Glasgow, in 1809 he entered Balliol College, Oxford, where he gained first-class honors. In 1813 he was admitted to the Scottish bar, but never acquired a practice in his profession, his taste lying much more toward the study of philosophy, in which he had already made extensive researches. In 1829 the publication in the *Edinburgh Review* of his celebrated critique of Cousin's system of philosophy gave him a first place among the philosophical writers of the time. This was followed in 1830 by his criticism of the philosophic writings of Dr. Thomas Brown, the colleague of Dugald Stewart. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. Here he gathered about him a number of ardent students, and re-established the fame of the Scottish school of metaphysicians, which had begun to wane. In 1846 he published an annotated edition of the works of Thomas Reid and, in 1854, the first volume of a similar edition of the works of Dugald Stewart. He died suddenly at Edinburgh on May 6, 1856.

Ham'let, the greatest of the tragedies of Shakespeare, generally ranked first among dramas, deals with the ancient Danish story of a mythical or semimythical Prince of Jutland, named Amleth or Hamlet. But Shakespeare has dealt with this story in such a way that the tale is true for all time. "It is we who are Hamlet," said Hazlitt. The story, as told by Shakespeare, opens with Hamlit's vision of the ghost of his father. The ghost reveals to Hamlet what his prophetic soul had already suspected, that his uncle and mother were guilty of the murder of the late king, his father, who now demands vengeance. The tragedy hangs upon the strife within Hamlet's breast between the duty of vengeance thus laid upon him and his natural shrinking from violent action. After an interval of real or feigned madness. probably the latter, Hamlet takes the vengeance which has been forced upon him by the plots against his own life, and himself perishes in the act. The drama is marked by great situations, noble speeches and an unequaled mastery of the workings of the inmost souls of men. The text of the play is chiefly based upon the first folio edition of Shakespeare's collected works (1623) and the quarto edition of 1604. There are evidences that Shakespeare worked upon this drama at intervals during the greater part of his active literary career. Among the most famous passages in *Hamlet* may be mentioned the advice of Polonius to his son and the soliloquy beginning: "To be or not to be, that is the question."

Ham'lin, Hannibal, an American statesman, was born at Paris, Me., Aug. 27, 1809. He was a lawyer of prominence, was speaker of the state legislature in 1837-40, member of congress in 1842-44 and United States senator during 1848-57. Though previously a Democrat, he left his party because he was opposed to the extension of slavery, and was elected governor of Maine by the Republicans in 1857. The same year he resigned, and returned to the senate. In 1860 he was elected vice-president of the United States, serving under Lincoln from 1861 to 1865. He was again a member of the senate during 1869-81, and was minister to Spain in 1881-82. He died at Bangor, Maine, July 4, 1891.

Ham'merfest, a town in the province of Finmark, Norway. On account of its high latitude (70°, 40', 10") the sun remains above the horizon from the middle of May till the end of July. It has a considerable amount of trade with Norwegian, Danish. Russian, English and German vessels, exporting codliver oil and salted fish. It is said to be the most northern town in the world.

Ham'mond, Ind., a progressive city in Lake County, in the extreme northwestern part of Indiana, on Lake Michigan and within 20 miles of Chicago. It is situated on the Grand Calumet River and is served by fifteen railroad lines. It has a number of good schools and churches, with the adjuncts in electric railways and electric lights of a growing modern city. It is distinctly a manufacturing town, having large establishments, including steel works, large freight and passenger car plants, agricultural machinery, piano, medical and dental supply factories, and three large grain-products manufactories, besides printing, chemical, starch and glue-works, flour mills, wagon factories, and brick-yards. Population, **45,000**

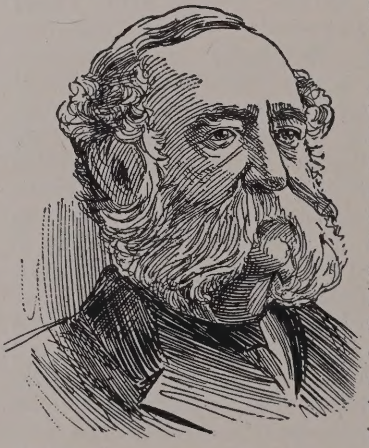
Hammond, William Alexander, an American physician, was born at Annapolis, Md., Aug. 28, 1828, and died at Washington, D. C., Jan. 5, 1900. He was appointed assistant-surgeon of the United States army in 1849, resigning in 1860 to accept the professorship of anatomy in the University of Maryland at Baltimore. During the Civil War he held the important post of surgeon-general. He was an acknowledged authority in the treatment of nervous diseases. Besides medical works, such as *Military Hygiene*, *Sleep and Its Nervous Derangements*, *Insanity in Its Relations to Crime*, he published several novels — *Robert Severne*, *Dr. Grattan*, *Lal* and *On the Susquehanna.*

Hamp'den, John, English statesman and patriot, was born at London in 1594. He was a Puritan, a relative of Cromwell and one of his strongest and wisest supporters and advisers. He was educated at Magdalen College, Oxford, and entered Parliament in 1621. Here, although no orator, through his judgment, moderation, purity and force of character he took a leading position in the party. He was noted for his opposition to the unjust measures of King Charles, especially for his refusal to pay the ship-money tax. He took a leading part in the memorable Long Parliament, and was one of the five members whose attempted seizure by King Charles on Jan. 4, 1642, precipitated the Civil War. When hostilities began, he joined the parliamentary army, contributed liberally to its support, raised a regiment of infantry and in the struggle that ensued displayed great bravery and generalship. He was mortally wounded at Chalgrove Field, June 18, 1643, and died June 24. Such was his capacity as a statesman and a soldier that Macaulay has said that, if he had lived, he would have been the Washington of England. See *History of the Great Civil War* by Gardiner and *Arrest of the Five Members* by Forster.

Hamp'ton Normal and Agricultural Institute, Hampton, Va., founded by Samuel Chapman Armstrong in 1868 as a school for negroes, was started under the auspices of the American Missionary Association, but was granted a charter in 1870 by the Assembly of Virginia, and is now controlled by a board of seventeen trustees. In 1878 Indians were admitted. The present plant includes 1,000 acres of land and is practically an industrial village with about 900 boarding students, and over 400 day pupils in the teachers' training school. The principles and practice of teaching, home economics, manual training, agriculture, business methods, military discipline, and thirteen trades are taught. Special emphasis is placed upon the educational value of manual work and upon the development of character. The students earn part of their expenses. The school is supported largely by voluntary contributions. Over 8,000 graduates and ex-students, of whom Booker T. Washington (q. v.) was one, have been sent out as teachers, farmers, skilled tradesmen, and community workers.

Hampton Roads, an arm of Chesapeake Bay on the Virginian coast, forming the entrance of James River. It is defended by Fortress Monroe, which is on the northern shore. Here, on March 8, 1862, the United States war-vessels, *Congress* and *Cumberland*, were sunk in a naval battle with the Confederate ironclad, *Merrimac;* and on the 9th of March the contest between the *Monitor*, the first turreted vessel, and the *Merrimac* took place.

Hampton, Wade, a distinguished soldier of the Confederacy and a United States senator. He was born at Charleston, S. C., March 28, 1818, the third of the name in a distinguished family. He was educated at South Carolina University, and served in the legislature of the state. Here he opposed secession, but, when the ordinance was passed, entered the Confederate service as a private. During the course of the war he rose to the rank of lieutenant-general, and was in command of the cavalry arm, first in Lee's army and later in Johnston's. In 1878 he was elected governor of South Carolina, and was chosen United States senator from that state in 1879. In 1893 he was appointed United States commissioner of railroads. He died on April 11, 1902.


WADE HAMPTON

Hamster, the genus *Cricetus* of the rodent mammals of the family *Muridæ*. These animals are related to the American pouched rats. They have plump bodies with short legs and tail, five toes on the hind foot and four toes and a "thumb-wart" on the front foot. The cheek-pouches are exaggerated, reaching almost to the shoulders. There are nine species, of which the most important is the common hamster. It is about one foot long, yellowish-grey on the upper part of its body and black on the lower, with several yellow-white patches on the sides, and white feet. This species is scattered from the Rhine to the middle of Siberia and as far south as the Caucasus. It stores food in its burrow and hibernates through the winter. Such immense galleries are made that a single pair of these rodents have been known to store 170 pounds of grain in a single season. The hamster is very prolific, having as many as sixteen young. It has become such a pest in Belgium that the government has offered a bounty for its destruction.

Hamsun, Knut, a Norwegian poet, dramatist, and novelist, was born in Lom, Gudbrandsdal, on August 4, 1860. He was the son of Peder Pederson and Tora Olsdatter. His father was a poor tailor, and he was reared by an uncle in one of the Lofoten Islands. Young Knut became a cobbler's apprentice, and saved his money so that at the age of eighteen he could publish a poem, *Et gjensyn,* and a novel, *Björger*. The works have little merit but he was not discouraged. Hamsun worked as tutor, longshoreman, coal-trimmer, and court messenger, for money with which to enter the University of Christiania, but was forced to leave because he was not prepared for the work he attempted, and could not continue it. Mr. Hamsun then became ambitious to enter the Unitarian Ministry. He came to America steerage and filled various positions. He was a farm hand and a dairyman in Dakota, a street car conductor on Halsted Street in Chicago, and a lecturer on French literature in Minneapolis, in addition to other minor occupations. He returned to Christiania and tried being an author again, but without very much success. For the next three years he worked on a Newfoundland fishing boat. This was the end of his long apprenticeship.

It seemed as if the twelve long years of fighting hardship and failure had actually served as real preparation for authorship. He had been learning to know himself and to know life. He wrote for a Danish periodical a fragment called *Sult* (*Hunger*) in 1888. This gave him instant place in the rank of the Young Northern authors. It was later enlarged and published as a book. The book portrayed the struggles of a young writer, and was written without bitterness although it was almost wholly autobiographical, relating Hamsun's early difficulties in Christiania.

Since the publication of *Hunger,* his rise has been rapid, although the English-speaking world did not know him until just a few years ago. He has written more than thirty books of various kinds. The life of Mr. Hamsun, during his years of authorship, has been a sharp contrast to his early struggles. He has lived quietly on an estate at Norholm near Grimstad in a "white two-story house at the end of a quiet bight of the sea." He is married and has five children. His chief interest is in this estate, where he works on the land himself. He has built a little cottage in a lonely part of his farm, and secludes himself there from his family to write.

The works of Knut Hamsun have been translated into twenty-three languages. In 1920 he was awarded the Nobel Prize for literature, at which time the published editions of his books covered 65,000,000 pages, and he was not yet introduced to America. His works include: *Segelfoss* (1915); *Markens Gröde* (1917) tr. as *Growth of the Soil; Sproget i fare* (1918); *Konerne ved Vandposten* (1920) tr. as *The Women at the Pump*; *Livet ivold* (1921); *Dikte* (1921); *Siste Kapitel* (1923); *Children of the Age* (1924); *Landstrykere* (1927); *Chapter the Last* (1929), and *Vagabonds* (1930).

Hamtramck (*hăm-trăm-ăk*), a city in Wayne County, Michigan, is situated five miles northeast of Detroit. The chief manufactures are iron and aluminum castings, and automobile accessories. Hamtramck was incorporated in 1901, and has grown rapidly. The population in 1920 was 48,615; in 1930, it had reached 56,268.

Han (*hăn*), a Chinese dynasty which extended from about 206 B. C. to 220 A. D. It was founded by Liu-pang, who was born in 247 B. C. He was a soldier of fortune who became Duke of P'ei, and afterward Prince of Han. About 206 B. C. he became the Emperor and established the capital at Changan (now Signanfu in Shensi). He died in 195 B. C., but the dynasty endured through many reigns. In 25 A. D., during the reign of the fifteenth Emperor, the capital was changed to Loyang in Honan. The dynasty was correspondingly divided into Western or Former Han and Eastern or Later Han. Fourteen emperors ruled during the Former Han, twelve during the Later, and two during the Minor Han, one of the Three Kingdoms into which the dynasty was divided in 220 A. D. The Minor Han lasted from 221 to 264 A. D. This dynasty is noted for the revival of letters, the introduction of Buddhism, and the extension of Chinese rule over Mongolia.

Hanau (*hä'nou*), a city in the state of Prussia in the Republic of Germany, is situated at the junction of the Kinzig and Main rivers, thirteen miles northeast of Frankfort. It is noted as the birthplace of the brothers Grimm. Hanau is famed for its jewelry, and gold and silver wares. It also manufactures woolen and silk goods, leather, paper and carpets. The population is about 37,000.

Han'cock, John, an American statesman, was born at Quincy, Mass., Jan. 12, 1737. He became a prominent merchant in Boston, having received a large fortune from an uncle in whose counting house he had been trained. He was a member of the legislature of Massachusetts in 1766. The attempt to seize his sloop *Liberty* for evading the customs-law caused a riot, and the royal commissioners barely escaped with their lives. An address, delivered at the funeral of the victims of what is known as the Boston Massacre, offended the colonial governor, who attempted to seize Hancock and Samuel Adams; and after the first battle of the Revolution the governor offered pardon to all except these two. He was president of the Continental Congress, and his name stands first on the Declaration of Independence. During the Revolutionary War he was a major-general of militia, serving in Rhode Island. In 1780 he was made the first governor of his state and, with the exception of two years, he was re-elected every year until his death. He was a fine speaker and a dignified presiding officer. His large fortune he used liberally. He died at Quincy, Oct. 8, 1793.

GEN. W. S. HANCOCK

Hancock, Winfield Scott, one of the most distinguished generals of the Civil War, was born at Montgomery Square near Philadelphia, Feb. 14, 1824. He graduated at West Point in 1844, served in the War with Mexico, and was a captain in the regular army when the Civil War broke out. He was commissioned brigadier-general in 1861, helped to organize the Army of the Potomac, and did gallant service in the battles of South Mountain and Antietam. He was made major-general of volunteers in 1862. At Fredericksburg he led his corps, 5,000 strong, to the desperate assault on Maryes' heights through a deadly fire from which less than 3,000 came back. At Gettysburg he was in command of the Second Corps, and was severely wounded, but stayed on the field until Pickett's desperate charge was repulsed by his corps. In 1864 he bore an important part in the hard-fought battles of the Wilderness, Spottsylvania and Cold Harbor, at Spottsylvania carrying the Confederate works known as the "bloody angle" and capturing 3,000 prisoners. He was made a brigadier-general in the regular army in 1864, and promoted to major-general in 1866. At the close of the war he was placed in command of the department of the Missouri. From 1872 until his death he was in command of the division of the Atlantic. He was the Democratic candidate for the presidency in 1880, but was defeated by Garfield. He died at Governor's Island, N. Y., Feb. 9, 1886. Hancock was a brave, fearless leader, and an able commander. McClellan called him "superb," and Grant wrote: "Hancock stands the most conspicuous figure of all the general officers who did not exercise a separate command." See *Life* by Junkin and Norton and *History of the Second Corps* by Walker.

Hand, the extremity of the fore limb, including the wrist and the parts below it. The name is usually applied to the human hand and that of apes and monkeys, but, technically, it should embrace the extremity of the fore limbs of other vertebrated animals. The fore limbs are composed of corresponding parts in the different vertebrates; for example, the paddle of a whale, the wing of a bird, the wing of a bat, the fore limb of a dog or a horse are all equivalent structures, with bones, muscles and other parts corresponding to those in the arm of man. The hand proper consists of the wrist or carpus, the palm or metacarpus and the digits or fingers, corresponding respectively to the ankle, instep and toes of the foot. There are in all twenty-seven bones in the human hand—eight wrist or carpal bones, five metacarpals and fourteen phalanges belonging to the thumb and fingers. In man the thumb is opposable, or can be touched to the different fingers, and the hand, therefore, under the direction of the mind is a most marvelous instrument, being adapted to handling with accuracy minute objects, turned to the uses of art etc. In the minds of philosophers this adaptability of the hand has been an important factor in the progress of the race from a barbarous condition to one of a high grade of civilization. The hand is capable of much training, and the cultivation of its powers reacts upon the mind, as is shown in manual training, the educated touch of surgeons etc. The hand of apes is less perfect; it suffices for grasping, but the thumb is not so movable and it lacks the possibilities of the human hand. As is well-known, the feet of apes and monkeys have a grasping power also — the great toe is separated from the others by a considerable space. This led Cuvier to make a group, called the four-handed (*quadrumana*), to contain the apes and monkeys, and another group called the two-handed (*bimana*), for man. The various modifications of the hand in different vertebrates are interesting. In birds the bones above the wrist correspond to those of the human arm, but those of the wrist and hand have been reduced and consolidated; there usually is a rudiment of the thumb, the metacarpal and phalanges of the first finger being well-developed, and the rudiment of the second finger. In the horse more extensive changes have taken place, so that the fore limb rests upon the extreme tip of the third finger; the corresponding metacarpal bone is large and firm. There also are two rudimentary bones (the splint bones) representing the second and fourth bones of the palm of the hand, that formerly were fully developed and had jointed digits corresponding to fingers. See FOOT.

Handel (*hăn′dĕl*), **George Frederick,** a famous musician and composer, was born at Halle in Saxony, Feb. 23, 1685. His passion and genius for music were shown at an early age. When about eight, he was placed under Zachau, organist at Halle, and at nine he was master of the organ, violin and other instruments, and wrote a musical composition every week. His first opera, *Almira*, was brought out in January, 1705, and others followed rapidly. Two years later he went to Italy, where he spent three years and enjoyed a great triumph, visiting Florence, Rome, Naples and Venice. He then visited London, and in 1712 took up his residence there. In 1720 the Royal Academy was founded in the Haymarket, "to secure a constant supply of operas by Handel, to be performed under his direction." Here he remained for 17 years, and produced a great number of operas. His health broke down in 1737, and his career as manager and composer of operas was ended. After resting for a time, he recovered his health, and from this time gave his life to the production of English oratorios. This departure led to his greatest triumph. *Saul*, *Israel in Egypt* and the *Ode for St. Cecilia's Day* were all produced in 1739. *The Messiah* appeared in 1742, followed by many others during the next ten years. Handel's music had now taken wider possession than ever of the public, bringing him both fame and money. In 1750 he went abroad, and after his return wrote *Jephthah*, his last oratorio. In 1752 he had lost his sight almost entirely. He died at London, April 14, 1759. See *Life* by Rockstro.

Hang-Chow (*hăn-kou′*) or **Hangchau,** the capital of the province of Che-kiang in China, is situated on the left bank of the Tsien-tang River, where it empties into the Bay of Hang-Chow. It is one of the great commercial, religious and literary centers of China; has clean, well-paved streets and many magnificent temples; and is a principal seat of the silk-manufacture. It formerly had a population of 2,000,000, but during the Taiping rebellion, in 1861, it was laid in ruins, and its present population is not more than 826,000.

Hang′ing Gar′dens of Ba′bylon. These were once reckoned among the wonders of the world. They are supposed by some to have been built by the imaginary Queen Semiramis, while by others they are ascribed to Nebuchadrezzar. They are said to have formed a square with an area ot four acres, and rose in terraces supported on arches of masonry to a height of 75 feet. They were watered from a reservoir built at the top, which was supplied from the Euphrates. They were filled with trees, flowers and fountains; banqueting-rooms were distributed throughout; while the view of the city and surrounding country was extensive and magnificent.

Han′na Marcus Alonzo, U. S. senator, was born at New Lisbon, O., Sept. 24, 1837, and removed to Cleveland in 1852, where he lived until his death in 1904. He was educated at Western Reserve College. Early engaging in business he rose to prominence, becoming head of M. A. Hanna & Co. and president of the Union National Bank, of the Cleveland Railway Co. and of Chapin Mining Co., Lake Superior. He was elected to the U. S. senate in 1897 and in 1904, and was a forceful and influential member.

Han′nay James, D.C.L., historian, was born at Richibucto, New Brunswick, April 22, 1842. He was called to the bar in 1866, was reporter of the supreme court from 1867 to 1873, editing two volumes of its reports, and was thereafter occupied for many years in editing newspapers in New Brunswick and the United States. He has been official reporter of the provincial parliament since 1901. Besides many minor articles he has published *History of Acadia*, *The History of the Loyalists*, *The History of New Brunswick* and *The History of the War of* 1812.

Han′nibal (meaning the grace of Baal), was the son of the great Carthaginian general Hamilcar, and was born 247 B. C. When his father went on his great campaign into Spain, he took Hannibal, then in his ninth year; and it is said that before starting he led him to an altar and bade him swear eternal enmity to Rome. For nine years he was trained under Hamilcar in Spain. After the death of his father he served under his brother-in law, Hasdrubal, until the death of the latter, 221 B. C., when the army with one voice chose Hannibal as their general. Determined to carry out his father's purpose to fight Rome on her own soil, Hannibal marched from New Carthage in 218 B. C. with 90,000 foot, 12,000 horse and 37 elephants. Crossing the Pyrenees, he was met at the Rhone by an army of Gauls. After defeating them, he crossed the Alps in 15 days in the face of obstacles which were overcome by matchless skill and courage. Thousands of his troops perished in the snow and ice and in fighting the native tribes which harassed his march. A part of his Spanish troops he was obliged to send home. When he reached Italy, he had but 26,000 men with whom to meet on their own ground a nation which could put 170,000 trained soldiers into the field. He met the Romans under Scipio at the River Ticinus. The Romans were driven back, and retreated beyond the Po. Hannibal crossed the river, and the first great battle was fought at the Trebia, resulting in the utter defeat of the Romans with a loss of 40,000 men. These battles were fought in 218 B. C. The next year he annihilated the army of the consul Flaminius, near Lake Trasimene, capturing 15,000 prisoners. The following spring he posted his army of 30,000 at Cannæ on the Aufidus. Here he was attacked by a Roman army under the consuls Æmilius Paulus and Terentius Varro. Hannibal drew his army across the mouth of a loop in the river, and ordered his center to retire before the attack of the Romans. The Roman legions pressed into the loop, when Hannibal's infantry, which were strongly posted on either side, fell upon the enemy's flanks, while the Numidian cavalry closed upon the rear. Thus assailed in front, flank and rear, the Roman army, confused and broken, was hewn down through eight hours of carnage till 50,000 men lay dead on the field. "Send me on with the horse, general," cried Maherbal, the leader of the Numidian cavalry; "and in five days thou shalt sup in the capital." But Hannibal knew that his forces were unequal to the task of storming a walled city, garrisoned by a population of fighting men. The soundness of judgment, the patience and self-control he evinced in this hour of intoxicating triumph are hardly less marvelous than the genius by which his success had been won.

Hitherto Hannibal had swept everything before him, but after the battle of Cannæ the tide turned. His niggardly, shortsighted countrymen denied him the support without which success was impossible Still, through long years of struggle in Italy, he was never defeated, and overcame the Roman army again and again. But in 207 B. C. his brother, Hasdrubal, marching from Spain to his aid, was surprised, defeated and slain at the Metaurus by the consul Nero. This battle sealed the fate of "the lion's brood" of the great Hamilcar; but for years Hannibal stood at bay, defying with his thinned army every general sent against him, until in 202 B. C. he was recalled to Africa to repel the Roman invasion In the same year he met Scipio at Zama; his raw levies fled; his veterans were cut to pieces where they stood; and Carthage was at the mercy of Rome. So ended the Second Punic War, which has well been called the war of a man with a nation and perhaps the most wonderful war in all history. When peace was made, Hannibal became the highest officer in his state and effected many reforms in the government of Carthage. These reforms made him enemies, who caused the Romans to demand his surrender to them. To avoid this, he left Carthage, and years later baffled his enemies by finally taking poison, which, we are told, he carried with him in a ring, and died at Libyssa about 183 B. C. There is not in all history so wonderful an example of what a single man of genius may achieve against tremendous odds as is found in Hannibal, the greatest captain the world has seen. See *Carthage and the Carthaginians* by Bosworth Smith; *Life* by Arnold; and *Hannibal*, by Dodge, in the Great Commanders Series.

Hannibal, a city in Marion County, Mo., on the west bank of the Mississippi, which has grown steadily during the last 20 years. It has excellent facilities for shipping, having eight railroads, six of which terminate there, and competing river-steamers. The city has broad, handsome and well-paved streets, lighted by electricity. The water-supply is obtained from the river, two miles above the city; it first passes by gravity through a system of filters, and is then pumped into reservoirs. The principal manufactures are stoves, shoes, furniture, flour, cigars, lumber, car-wheels and foundry and machineshop products. It is well-equipped with churches and banks, and has an excellent school-system, which includes public, parish and colored high-schools, besides a free public library of 10,000 volumes. Population 18,443.

Hanno'ver, formerly a kingdom of northern Germany, in 1866 became a part of Prussia. Its area is 14,869 square miles; population 2,942,546. It is a part of the great North German plain, except in the south where are the Harz Mountains. It is watered by the Elbe, Weser, Ems and their tributaries. The people are engaged in mining, farming and stockraising. The mines produce iron, silver, zinc, copper, lead and coal. Among Hannover's more important industries are manufactures of linen, woolen and cotton goods, iron, glass, paper and pottery. Göttingen is the seat of a university, and the capital is Hannover, situated 158 miles west of Berlin. It is a center of the North German railroad system and has varied and important manufactures. Population 302,384. Low German is spoken in the rural districts, but high German is the language of the educated classes and is spoken with more purity than in any other part of the empire.

Han'over, a small town in New Hampshire, on the Connecticut River, 55 miles northwest of Concord. Dartmouth College, which is situated here, was the fourth college founded in New England, and grew out of an Indian school in Connecticut, which was moved to Hanover in 1769. It was named after Lord Dartmouth, an English benefactor. The legislature of the state attempted to change its name to Dartmouth University and take control of it, but failed, Daniel Webster making one of his famous speeches in favor of the college. It has 118 professors, 1,229 students and a library of 110,000 volumes. New Hampshire Medical College, Chandler Scientific School and the State College of Agriculture are connected with it. Hanover also has Thayer School of Civil Engineering, Amos Tuck School of Administration and Commerce, Dartmouth Summer-School and Fayerweather School of Tanning. Population of Hanover 2,075.

Hanseatic (*hăn'sē-ăt'ĭk*) **League** or **Hansa,** an association of cities in the north of Germany and adjoining states, which was formed in the middle ages and flourished for several centuries. The object of the League was the mutual protection and development of trade interests. It sought to gain and hold for these cities a monopoly of trade by securing special privileges and favorable conditions from the kings and rulers of the various countries where they had established trade, and thus shut out all rivals. As the cities grew in wealth and commerical importance, the League came to have political influence and power. It supplied money to the kings of England and other countries, and in return received valuable advantages. In 1370 it compelled humiliating concessions from King Waldemar of Denmark, and after that claimed the right of controlling the choice of the sovereigns of that country. The League at one time numbered as many as 77 cities, probably more, including Bremen, Cologne, Lübeck and Hamburg. The affairs of the League were managed by deputies representing the towns belonging to the League, who met, as a rule, every year, usually at Lübeck, where the records of the Hansa were kept. The League began to lose its power in the 16th century. From 1628 onward the only cities which sought to maintain the organization were Lübeck, Hamburg and Bremen. In 1870 these cities became a part of the German empire, and in 1889 all had joined the German customs union. See *Hansa Towns* by Zimmern.

Hap'good, Norman, author and critic, born in 1868 in Chicago, secured the degree of A. B. from Harvard in 1890, A. M. and LL. B. in 1893. Since graduation he has been engaged in critical and journalistic work. In 1895 he joined the staff of the N. Y. *Evening Post*, and in 1897 became dramatic critic of the N. Y. *Commercial Advertiser*. He has written *Literary Statesmen and Others*, *Daniel Webster* and *Abraham Lincoln*, and is a prolific contributor to magazines. He is now editor of *Colliers' Weekly*.

Haps'burg, House of, of which the reigning family of Austria are the representatives, derived its name from the castle of Habsburg in the Swiss canton of Aargau. The founder of the family was Albert, who is mentioned in the annals as Count of Hapsburg in 1153. He was appointed landgrave of upper Alsace by Emperor Frederick I. Under his son, Rudolph I, the family became one of the most powerful in Swabia. Rudolph III (Rudolph I of Austria) was elected emperor in 1273, and some representative of the family has worn the imperial crown almost continuously, either in Austria, Germany or Spain, down to the present time. See *History of the House of Austria* by Coxe.

Har'court, Hon. Richard, K.C., D.C.L., LL.D., son of the late Michael Harcourt, M. P., was born in Toronto, March 17, 1849, and educated at its university. He has been a member of Ontario Legislature continuously since 1878, a member of the cabinet since 1888, and late Minister of Education. He was treasurer of the Province from 1888 to 1898. His home is at Welland, Ont.

SIR WILLIAM HARCOURT

Harcourt, Sir William George Granville Venables Vernon, an English statesman, was born at Nuneham Park, Oxford, Oct. 14, 1827. He graduated with honors from Trinity College, Cambridge, in 1857. He was made queen's counsel in 1866, and in 1868 entered parliament as a Liberal from the city of Oxford. In 1869 he became professor of international law at Cambridge University, retiring in 1873 to become solicitor-general under the Gladstone administration The same year he was made a knight, and during Gladstone's second administration (1880-85) was made home-secretary. He was a vigorous advocate of the Irish Home Rule measures proposed by Gladstone, which were defeated in 1893. From 1895 till his death he was a member of the house of commons, representing West Monmouthshire. On his party's return to power in 1886, he was made chancellor of the exchequer and again in 1892-95. In 1895 he became leader of the Liberals in the house of commons, resigning the leadership in 1898. An able speaker and debater, he had intimate knowledge of public offices, especially in economics and finance. He was a clear writer upon his especial topics contributing to *Saturday Review*, writing also upon international law in the London *Times*, under the name of Historicus. He died Oct. 1, 1904.

Harding, Warren G., twenty-ninth president of the United States. Born at Corsica, Ohio, November 2, 1865, worked way through Ohio Central College, learned printer's trade, and, with money loaned by his father, became owner and publisher of the then struggling *Marion Star*, which he soon developed. Was state senator (1899–1903), lieutenant-governor (1904–5), defeated for governor in 1912, elected United States senator in 1914, and to presidency Nov. 2, 1920, defeating Gov. Cox of Ohio, Democratic candidate. He selected a strong cabinet, including Charles E. Hughes and Herbert Hoover. A notable reform was establishment of a budget bureau. Treaties of peace with Germany and Austria were signed in 1921, and late that year, extending into 1922 the Washington Conference on the limitation of armaments was held. Settlement of important controversies among Central American countries was effected, and better Pan-American feeling engendered. Returning from a trip to Alaska, the President delivered an address on Alaskan conditions at Seattle, Wash., July 27, 1923. While there he became ill with ptomaine poisoning, followed by pneumonia with complications which resulted in his death at San Francisco Aug. 2. Interment was made at Marion.

THOMAS HARDY

Hardy, Thomas, British novelist, was born in Dorsetshire, England, June 2, 1840, and educated at King's College, London. He commenced his career as an architect, but after winning a prize and medal for an essay dealing with Colored Brick and Terracotta Architecture, he devoted himself to fiction-writing and dramatic authorship. In 1874 the first of his notable novels appeared in the *Cornhill Magazine* —*Far from the Madding Crowd* — which was later on dramatized, and, with *The Three Wayfarers*, achieved striking success. His other stories include *Under the Greenwood Tree; A Pair of Blue Eyes; The Return of the Native; Western Tales; Life's Little Ironies; Jude the Obscure; The Well-Beloved;* and, the best of all his novels, *Tess of the D'Urbervilles.* See Mr. Lionel Johnson's *The Art of Thomas Hardy.* There is much imaginative power about Mr. Hardy's work, though somewhat marred by a pessimistic vein; while no writer of the time knows English Wessex, especially that section of the old Saxon kingdom in England known as Dorset and Wilts, better than he, or writes of it more delightfully.

Hare, a very common animal with long ears, a cleft upper lip, short tail and long hind legs. The hares and rabbits belong to the same group and are commonly confused; the smaller kinds that make burrows are more properly called rabbits, and the other varieties that lie in small depressions in the fields are hares. As the name (*Lepus timidus*) of the common hare of Europe implies, hares are very timid, but their long hind legs enable them to leap far and they are very swift. The cleft lip is so constant that the name hare-lip is given to a deformity of the lip and roof of the mouth in human beings. In the northern regions the common hare turns white in winter, and is then known as a polar hare. Hares and rabbits inhabit most parts of the world, but originally were absent from Australia and New Zealand; they were imported there but bred so rapidly that, in the absence of natural enemies, they became a great pest to the farmers. The family is best developed in North America, where there are about twenty species and varieties. Their food is entirely vegetable, consisting of herbage, succulent vegetables, roots and bark. They are very prolific; if not held in check they increase at such a rate as to do much damage to agriculture. Rabbit-drives and rabbit-fences have arisen as protests against their depredations, especially in California and Colorado, where they have proven great pests. Their natural enemies are birds of prey, serpents and carnivorous animals — fox, dog, mink, marten, lynx, skunk etc. They are protected by their coloring, remarkable sense of hearing, keen sense of sight and smell, ability to get over the ground in great leaps and agility in turning and doubling when pursued. The common gray rabbit or cotton-tail of the United States is well-known. The species (*Lepus cuniculus*) which is the original of the breeds of pet rabbits in its wild state is grayish-brown above, with reddish color on the neck, black on the lower surface of the tail and whitish on the under part of the body The pet rabbits range in color from white to black and many spotted varieties. The jack-rabbits of the western states are of large size and usually have long ears. Some varieties turn white in winter, and others do not. They are very swift, progressing by long jumps. Like most hares, they make a "form" in the field in which they lie during the day. Although they make no burrows, they take to holes when pursued by hounds.

Hargreaves (*här′grăvz*), **James,** the inventor of the spinning-jenny, was an uneducated weaver and carpenter of Standhill in Lancashire, England, where he was born in 1745. It is said that he was led to the invention from seeing a spinning-wheel, which one of his children had upset, continue to revolve horizontally while the spindle worked vertically. So strong was the prejudice of the weavers against the introduction of his machine, that they broke into his house and destroyed it. He removed to Nottingham in 1767, where he erected a spinning-mill. Three years later he took out a patent for his invention, but, as it was proved that he had sold several machines before the patent was obtained, it was for that reason declared void. Hargreaves died on April 22, 1778. See *Lancashire Worthies* by Francis Espinasse and *Lives of Eminent Mechanics* by Henry Howe.

Har′lan, John Marshall, was born in Boyle County, Ky., June 1, 1833. He was a colonel in the Union army in 1861, and in 1863 he was made attorney-general of Kentucky, and became one of the associate justices of the United States supreme court in 1877. In 1893 he was one of the American arbitrators on the Bering Sea tribunal which met at Paris. Died Oct. 14, 1911.

Har′land, Marion. See TERHUNE, MARY VIRGINIA.

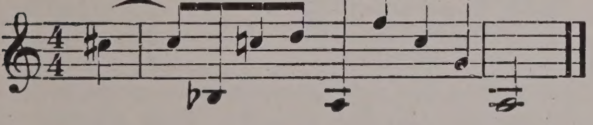
Har′ley, Robert. See OXFORD, EARL OF.

Har′mar, Josiah, an American general in the Revolutionary War, was born at Philadelphia in 1753. He served as lieutenant-colonel under Washington in 1778–80, and with General Greene in the south in 1781–82. He was selected to carry to France the ratification of the treaty with England, which ended the Revolutionary War, and became general-in-chief of the army in 1789. Fort Harmar, at the mouth of Muskingum River on the Ohio, was named after him. He died at Philadelphia, Aug. 20, 1813.

Har′mony, from the Greek word *harmonia*, meaning "a concord of sounds, music, or a system of music" (which itself is probably derived from an ancient root-word meaning to fit or join), is one of the three essentials elements of music, without which music never has existed and never can exist.

If the following succession of sounds, called tones,

EXAMPLE 1



be thought, sung or played, it will be felt to be as meaningless, as incoherent, musically, as the following succession of sounds, called syllables,

EXAMPLE 2

Eightnez zar nebkud you ha

is incoherent and meaningless as language. That is, the succession of tones in Example 1 does not express music, although there is rhythmic coherence; nor does the succession of syllables in Example 2 express language.

In the following succession of syllabic sounds

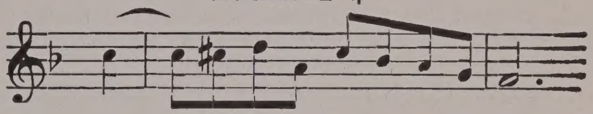
EXAMPLE 3

Nebuchadnezzar ate hay

coherency, unity and meaning — therefore language — appear, although we have precisely the same sounds as in Example 2. The difference is solely in the relation of the sounds in respect to their order and groupings.

Similarly the following succession of tones, all of which are to be found in Example 1,

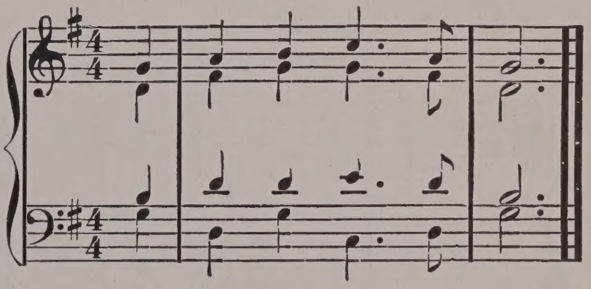
EXAMPLE 4



expresses coherency, unity and music, because a feeling of tonal relationship is immediately recognized. There is a vital distinction to be made, however, between the syllabic and tonal relations. In the former they are largely if not purely arbitrary relations in respect to order and grouping established by usage; in the tonal succession, on the contrary, the relationship is not arbitrary, but immanent in every coherent grouping of tones, whether conceived of successively or simultaneously.

Further observation of melody reveals the fact that each melodic incident suggests a group of simultaneous tones in a definite relation to one another, as represented in the following example:

EXAMPLE 5



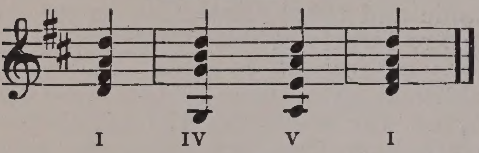
That is, the first, third and sixth tones of the melody suggest the group *g, b, d;* the second and fifth tones, *d, f̄, a* (the line over a letter stands for a sharp); and the fourth tone, *c, e, g.* Here again we see that relation, that is, harmony, is the basis of the unity of these groups of simultaneous tones. Such groups of simultaneous tones expressing definite relationships are called, in general, *chords.*

Besides the simultaneous conception of relations, each chord of the series in Example 5 clearly expresses a definite chord relation or harmony. The first chord expresses the idea of harmonic center, harmonic point of unity, and is called the *tonic harmony*. The second chord expresses the idea of harmonic progression to the tonic harmony, and is called the *dominant* harmony. The third chord is tonic. The fourth expresses progression through the dominant (fifth chord) to the tonic harmony, and is called the *subdominant* harmony. Tonic is represented by I, dominant by V, subdominant by IV.

It is plain from this that melody expresses two distinct conceptions of relationships or harmony: first, those relationships constituting the unity of the *simultaneous* grouping of *tones*, called, in general, *chords*, as we have seen; and secondly, those relations constituting the larger unity of *progressive* groupings of *chords*, called, in general, *tonality*. Chord and tonality are, therefore, distinctly harmonic ideas.

These three harmonies and their chords express not only a general but a specific idea of tonality, called *diatonic* tonality, and is illustrated in the following example:

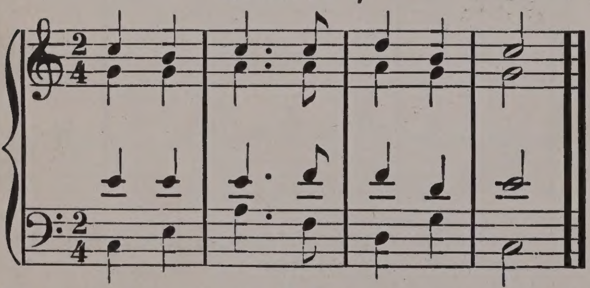
Example 6



Besides the three harmonies, diatonic tonality involves seven melodic incidents: 1, 3, 5 = tonic chord; 5, 7, 2 = dominant chord; 4, 6, 1 = subdominant chord. Chord also involves the harmonic unit called *interval*—the relation of any two of these melodic incidents. These are called *primes*, *seconds*, *thirds*, etc., according to the number of degrees involved.

In the following example:

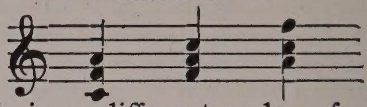
Example 7



besides the tonic, subdominant and dominant harmonies, called *primary* harmonies, the second, third and fifth chords present three new harmonic ideas called, respectively, *mediant*, with its chord, *e*, *g*, *b*; *submediant*, with its chord, *a*, *c*, *e*; and *supertonic*, with its chord, *d*, *f*, *a*. These are designated as *secondary* harmonies.

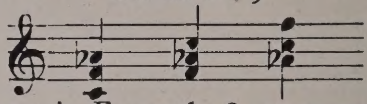
Each tone in the chord-groups of the following example:

Example 8



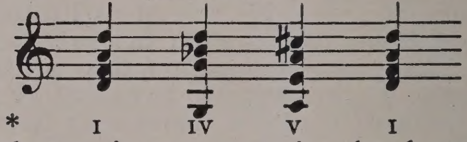
although in a different order of grouping, expresses essentially the same idea of relationship. *F* is felt to be the basic incident, called *root*, and defined as such by the tone *c*, called *fifth*. This root-defining nature of *c* becomes apparent if we substitute b̲ (the line under the letter stands for a flat), in which case *f* no longer appears as the basic incident or root. The remaining incident of the chord is a variable element, illustrated in Example 9:

Example 9



The tone *a* in Example 8 expresses a relatively bright color, called the *major mode;* *a*, in Example 9, a dark color, called the *minor mode*. This color incident of the chord is called the third. Chord, therefore, is a harmonic unity involving root, third and fifth, and named by the root-tone, *i. e.*, chords of *a*, *b*, etc. Applying this dual nature of the chord to Example 6, substituting the minor for the major mode of the tonic and subdominant chords, as follows,

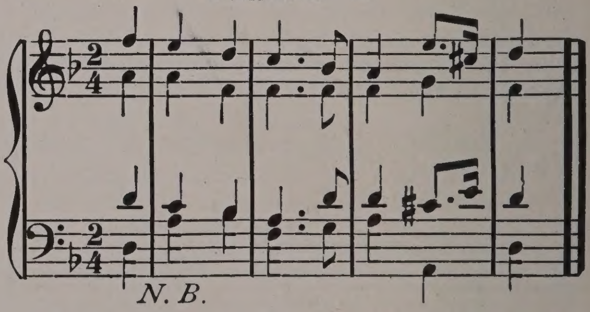
Example 10



no change is apparent in the harmonic character of each chord; the first chord is still tonic, the second chord subdominant, the third chord dominant. All that has been changed is the character, the mode of the tonic and subdominant chords.

In the following example:

Example 11



we find a change, also, in the mode of the dominant (N. B.) chord. This change of the mode of the chord (N. B.) does not affect its dominant character. The inclusion of the minor mode of the tonic, dominant and subdominant chords adds three new melodic incidents to the diatonic tonality,—minor 3 or *mā* (*may*) of the tonic; minor 6 or *la* of the subdominant; and minor 7 or *tā* of the dominant.

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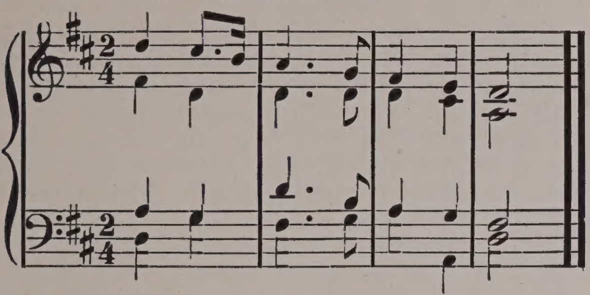
* Minor chords are represented by small numerals.

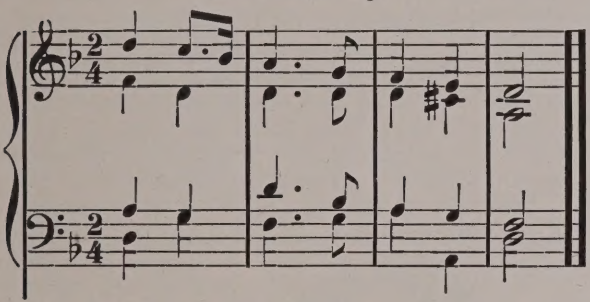
The first phrase of the familiar hymn: "Joy to the world, the Lord is come,"

Example 12



presents the tones derived from the major mode of diatonic tonality in the closest order of succession from upper *doh* to lower *doh*. Such a succession of the tones of any tonality is called its *scale*—in this instance the *diatonic* scale. Scale, therefore, is simply one melodic ordering of the tones of tonality. This same melody can be translated into the minor mode, and the same harmonies, chords and harmonic base applied.

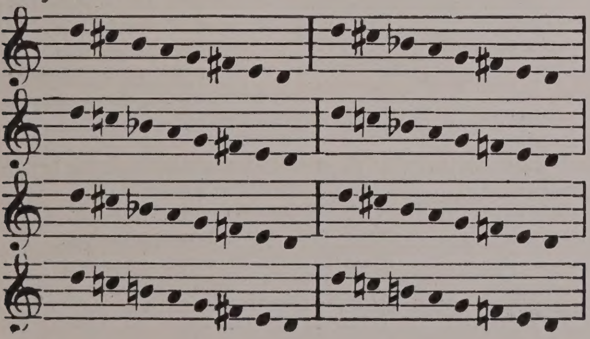
Example 13



The solidarity of the two modes of diatonic tonality is thus clearly demonstrated. It also is plain that, since scale is not the foundation of music and tonality but is one of the melodic expressions, diatonic tonality furnishes many scales, illustrated in the following example:

Example 14

Diatonic Tonality
Key of D

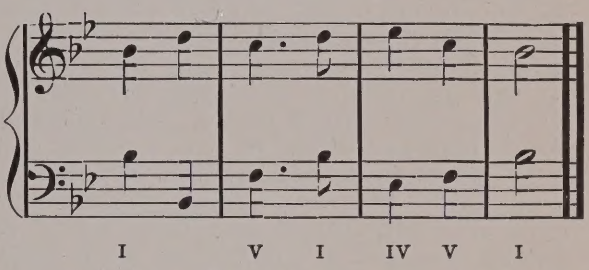


To summarize: Harmony is all the simultaneous and progressive conceptions of the tonal relationships involved in tonality. Tonality is the unity involving all such harmonic ideas. Melody is the outlining, through tonal succession, of a definite conception of tonality. Key is the definite group of tones expressing tonality. Scale is the stepwise ordering of these tones from *doh* to *doh*.

The first study of harmony should consist in an effort to discover in one's own mind, and to express, original melody. For, the moment that melody is conceived in thought, harmony and tonality are expressed.

The second step in the study of harmony should consist in an effort to imagine one or more accompanying melodies which shall more or less clearly express definite harmonies suggested by the original or given melody, technically called the *cantus*. These accompanying melodies may move above or below the *cantus*, and are of two distinct orders: (1) the *harmonic melodies* which simply outline the harmonic *bases* or fill in the chords of the harmony (see Examples 5, 7, 11, 12 and 13) and (2) the *contrapuntal melodies* which not only outline the harmony but have the true melodic significance.

Example 15



The next step in harmonic study would involve the completing of the expression of the harmonies by the filling in of the inner harmonic melodies and, also, the giving of many contrapuntal melodies to the original or given *cantus*. To the latter class of compositions the term polyphony more strictly applies. Where all the melodies but one are mainly harmonic, a composition assumes the character of what is called monody, although polyphonic in the sense of many voices.

Further development of the subject is impossible within the space allowed. It remains to say, however, that in the above simple outline of the primary elements of harmony and the elementary processes for the development of harmonic conceptions all the essential principles have been elucidated. The further study and development of the subject lies solely in the enlargement in respect to the amount and complexity of the harmonic material, greater insight into its artistic possibilities, and application to the structural and æsthetic development of the greater forms of musical art. C. B. CADY.

Harnack, Adolf, German theologian, one of the foremost of his day. Though born at Dorpat, in Russia, he was of German parentage, and was educated at Leipzig, where he began to teach in 1874. His lectures aroused such comment that he was appointed a professor in 1876, then only 25 years old. In later years he taught at Marburg and Berlin. He trained a whole generation of teachers in his "seminar" through, which he spread his ideas and methods throughout Germany and into foreign lands. Noteworthy features of his creed were his demand for absolute freedom in the study of church history and of the New Testament, his distrust of speculative philosophy, and his preaching of practical Christianity not as a system of theology but but as a religious life.

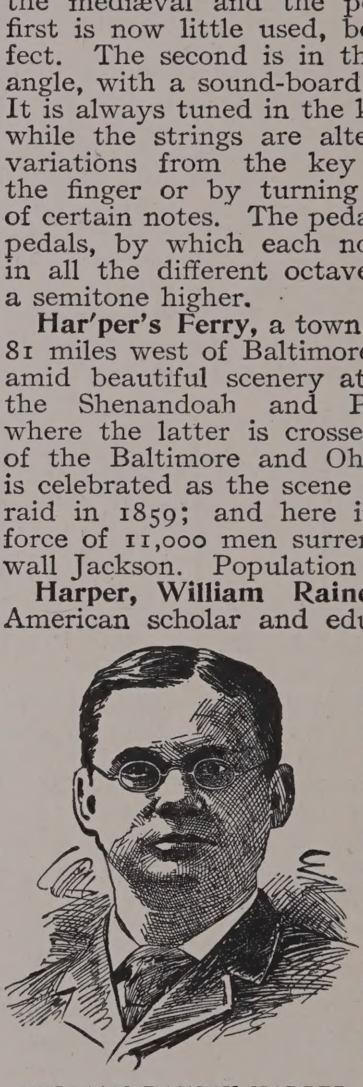
Harold II (*hăr′ŭld*), the last of the native English kings, was born about 1022, and was the son of Earl Godwin. At an early age he was made earl of the East Angles, and in 1053 succeeded to his father's earldom of the West Saxons. He became the right hand of Edward, king of the West Saxons (Edward the Confessor), and directed the affairs of the kingdom with a rare union of gentleness and vigor. King Edward died at the beginning of 1066, and with his last breath recommended that Harold be chosen king. He was crowned on Jan. 6, and at once was called to defend himself against two formidable enemies. Tostig, whose earldom of Northumbria had been taken, securing the aid of the king of Norway, marched against him. Harold met his enemy at Stamford Bridge, and defeated him after a bloody struggle. Four days later William, duke of Normandy, landed on the English coast. Harold hastened to meet him and fell on the bloody field of Hastings or Senlac (Oct. 14, 1066). No king ever fought more heroically for his crown. His tragic story has been made the subject of a novel by Bulwer-Lytton and of a drama by Tennyson. See *History of the Norman Conquest* by Freeman.

Haroun=al=Raschid (*hä-rōn′ äl-răsh′ id*) or Aaron the Just, caliph of Bagdad, was born in 763 and became caliph in 786. He was a scholar and poet, and by his taste and hospitality made his court the center of all the wit, learning and art of the Moslem world. The government of his kingdom he left to his grand vizier, Barmecide Gahya, and his four sons, and they served him well. But at length Haroun conceived a deep hatred of the vizier and his sons, and in 803 caused them to be put to death. The affairs of the kingdom now quickly fell into confusion, and rebellion broke out in every corner of the empire. Haroun marched in person against the rebels, but was attacked with apoplexy and died at Tûs in March, 809. Haroun the Magnificent is made the hero of many of the stories of the *Arabian Nights*, which have thrown a false halo around his memory; for with all his accomplishments he was in heart cruel. See *Life* by E. H. Palmer, in the New Plutarch Series.

Harp, a stringed musical instrument, much esteemed by the ancients. The Egyptian harp is shown in the most ancient sculpture, and stood seven feet high. The harp mentioned in the Bible was small, and could easily be carried in the hand In Ireland the harp was a favorite instrument from the remotest times. The Italians of the middle ages believed their harp to be derived from Ireland. The most familiar forms of the harp are the Italian, the mediæval and the pedal harp. The first is now little used, being very imperfect. The second is in the form of a triangle, with a sound-board and gut-strings. It is always tuned in the key of the music, while the strings are altered to suit any variations from the key by pressure of the finger or by turning the tuning-pins of certain notes. The pedal harp has seven pedals, by which each note of the scale, in all the different octaves, can be made a semitone higher.

Har′per's Ferry, a town of West Virginia 81 miles west of Baltimore. It is situated amid beautiful scenery at the junction of the Shenandoah and Potomac Rivers, where the latter is crossed by the bridge of the Baltimore and Ohio Railroad. It is celebrated as the scene of John Brown's raid in 1859; and here in 1862 a Union force of 11,000 men surrendered to Stonewall Jackson. Population 766.

Harper, William Rainey a prominent American scholar and educator. He was born at New Concord, Muskingum County, O., July 26, 1856. He graduated at fourteen from the Presbyterian College in New Concord, and later studied at Yale University. He was principal of a Masonic institute for boys at Macon, Tenn., in 1875, and in 1876 was placed in charge of Denison University, a Baptist college, at Granville; O. He became professor of Semitic languages in the Baptist Theological Seminary, near Chicago, in 1879. From 1886 to 1891 he was professor of Semitic languages and Woolsey professor of Biblical literature at Yale University. In the latter



WILLIAM RAINEY HARPER

year he was chosen president of the University of Chicago, adding to that office the duties of professor of Semitic literature. He was remarkably successful in raising large sums of money for the permanent endowment of that institution, obtaining many millions of dollars and equipping it with every facility for continuous academic terms and postgraduate instruction. He founded and for a time edited the *Biblical World* and the *American Journal of Semitic Languages and Literature*, the *American Journal of Theology*, *The Hebrew Student* and *Hebraica*. His chief published works embrace *Elements of Hebrew*, *Hebrew Vocabularies*, *Hebrew Method and Manual*, *Elements of Hebrew*, *a Critical and Exegetical Commentary on Amos and Hosea* and *The Trend of Higher Education*. He died on Jan. 10, 1906.

Harp'ies (whose name means the swift robbers), fabled creatures of Greek mythology, held to be ministers of the vengeance of the gods. Various accounts are given of their number and parentage. Homer mentions but one: later writers recognize three and call them the daughters of Poseidon or of Typhon. They are described as hideous monsters with wings, of fierce and loathsome aspect, with faces pale with hunger.

Harp'sichord, a keyed musical instrument, formerly much used but now little known. The sound from the strings was produced by a small piece of crow-quill or a piece of hard leather, which projected from a slip of wood called the jack, that stood upright between the strings and was pushed upward by the key, till the quill or leather twitched the strings, producing a rather shrill sound. After the invention of the pianoforte, the harpsichord was gradually superseded by the new instrument.

Har'raden Beatrice, an English writer of fiction, was born at Hempstead, England, Jan. 24, 1864. She was educated in Holland and England, graduating at the University of London. In 1891 she wrote for children *Things Will Take a Turn*, and in 1893 *Ships that Pass in the Night* appeared. The latter immediately attracted unusual attention. Since that date she has written several books of less note, including *In Varying Moods*, a collection of stories; *The Remittance Man*, dealing with an American subject; *Hilda Strafford*; *Untold Tales of the Past*: and *The Fowler*.

BEATRICE HARRADEN

Har'riman, Edward Henry, an American capitalist and railroad man, was born at Hempstead, N. Y., in 1848. He received only a common school education, and at 14 entered a broker's office in New York City. In 1878 he became a stock-broker himself, founding a firm which still exists. Within fifteen years he had acquired a fortune and had made a thorough study of American railways. In 1883 began his active interest in the management of railways. In 1898 he formed a company which acquired the Union Pacific Railroad, which had been in the hands of a receiver. Harriman was made president of the road, which under his management soon became a strong, efficient and profitable line. In 1901 he acquired the Southern Pacific, thus placing himself in possession of a system comprising two trunk-lines with a total length of 15,000 miles. With powerful financial banking Harriman became increasingly aggressive in extending his power, until in 1908 the roads under domination of this interest included the Illinois Central, Baltimore and Ohio, the Erie and other lines, with an aggregate mileage of 29,000 miles and a capitalization of $2,350,000,000. He had also acquired an interest in the Gould transcontinental lines. Died Sep. 10, 1909.

EDWARD HENRY HARRIMAN

Har'rington, J. B. Ph.D., LL.D., is director of the Macdonald chemistry and mining building and Macdonald professor of chemistry in McGill University. He was born at St. Andrews, Quebec, Aug. 5, 1848, and educated at McGill and Yale Universities, where he took high honors. From 1871 to 1881 he was lecturer in chemistry and mineralogist to the geological survey of Canada, being appointed David Greenshields professor of chemistry and mineralogy in 1883. He has held many offices of honor in learned societies, and has written many monographs, including a biography of Sir William Edmond Logan.

Har'ris, Joel Chandler, American journalist and author, editor of the Atlanta *Constitution*, was born at Eatonton, Ga., Dec. 8, 1848, and like not a few who have made names for themselves in letters, he had his first employment at the printer's case. He then studied law, and for a time practiced at Forsyth, Ga., but after a while he forsook law for literature, obtained a post on the Atlanta

Constitution, and at length became its editor. By this time he had made a loving and faithful study of the negro in the south. Recognizing the darkey's artistic possibilities in literature, he set himself to portray negro-life and dialect, as he so intimately and accurately knew it. How admirable was the study is manifest from even his first book, which appeared in 1880, entitled *Uncle Remus*. Never before had the negro and plantation-life been so aptly sketched as in "Brer Rabbit" and his darkey brothers in Georgia. This and his subsequent writings gave the author a secure place in American literature. His later books include *Mr. Rabbit at Home; On the Plantation; Sister Jane; Balaam and His Master; The Story of Aaron In the Wildwood; Plantation Pageants;* and *Chronicles of Aunt Minervy Ann*. Among his works in a more serious vein are *H. W. Grady* and *The Making of a Statesman*. He also wrote *Tales of the Homefolks; Stories of Georgia* and *Georgia*. He died on July 3, 1908.

JOEL CHANDLER HARRIS

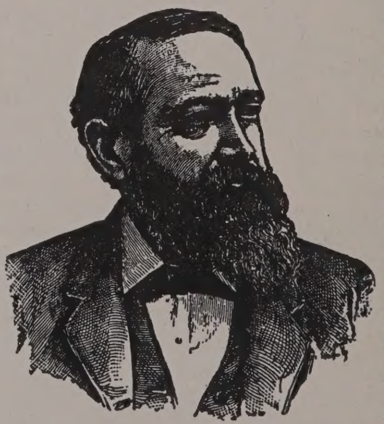
Harris, Robert, C.M.G., has been president of the Royal Academy of Canada since 1893. He was born in Wales and came as a child to Charlottetown, P. E. I., where he early displayed artistic talent. He studied at the Slade school in London, under Bonnat in Paris and in Italy, Belgium and Holland. He was the director of the Art school in Montreal from 1883 to 1887. His paintings are nearly all devoted to Canadian subjects, and he has painted many portraits of Canada's leading men. He has exhibited and gained prizes at the expositions in Paris, Chicago and Buffalo.

Harris, William Torrey, an American educator. He was born at Killingly, Conn., Sept. 10, 1835, and was educated at Phillips Andover Academy, Yale College and Germany. He was superintendent of the St. Louis public schools from 1868 to 1880; was founder of the Philosophical Society of St. Louis and of the *Journal of Speculative Philosophy*, the first periodical of its kind in America. He was made president of the National Educational Association in 1875, represented the United States government at the Brussels International Congress of Educators in 1880, and in 1889 prepared the official *Statement of the System of Education of the United States* for the Paris and Vienna Expositions, and was appointed United States commissioner of education by President Harrison. He resigned the office in 1906 and died in 1909.

Har'risburg the capital of Pennsylvania, was founded in 1785, and became the state capital in 1812. It is situated in the midst of beautiful scenery, on the Susquehanna, which is crossed by two bridges for railroads and two for driving. It contains the capitol, state arsenal, state insane asylum and 81 churches, including a Roman Catholic cathedral, with 222 good public-school buildings, and several institutions for higher education, besides state, public and school libraries. The prosperity of Harrisburg is to a large extent due to its facilities for communication with the coal and iron districts of the state. It has a number of blast-furnaces and rolling-mills and large manufactories of steel and iron, including boilers, machinery, nails, files, agricultural implements, engines, cotton goods, flour, bricks, shoes, brooms, gents' furnishings, woolen, knit and silk goods, electrical and plumbers' supplies. Furniture, stoves and typewriters are also produced, and there is a large trade in lumber. Harrisburg has the service of seven railroads and two electric street-railways, besides electric interurban lines. Population 89,000.

Har'rison, N. J., is a flourishing town in northeastern New Jersey, located on the Passaic River. It is connected with Newark by bridges across the river. Its industries include large steel-works, shade-roller and trunk factories, cloth, thread, wire, cutlery and machine shops and establishments for the manufacture of electrical supplies, marine engines, machinery, tubes, leather, ink and refrigerators. The famous Worthington pump works employ between five and seven thousand men. The civic equipment of Harrison includes, besides good schools and churches, the usual adjuncts of an ambitious, modern city, and it has the service of three railroads. The population is about 15,000.

Harrison, Benjamin, twenty-third president of the United States, was born at North Bend, Ohio, Aug. 20, 1833. His grandfather, William Henry Harrison, was the ninth president, and Benjamin's father was William Henry's third son. Benjamin Harrison graduated at Miami University, at Oxford, O., in 1852, and two


BENJAMIN HARRISON

years afterward earned his first money as a crier in the Federal court in Indianapolis, where he had gone to commence practice as a lawyer. He was elected supreme-court reporter of Indiana in 1860, but joined the army during his term. In 1862 he raised a company, of which he was made second lieutenant. As colonel of the 70th Indiana volunteers, he was ordered to Kentucky. He took part under Sherman in the Atlanta campaign, and distinguished himself at Resaca and at Peach Tree Creek. He also was engaged in the battle of Nashville in December, 1864, under Thomas; and in 1865 was made brevet brigadier-general. At the close of the war he again took up the practice of law. In 1876 he was nominated for governor of Indiana, but was defeated, though running 2,000 votes ahead of his ticket. He declined a seat in Garfield's cabinet in 1880. In 1881 he was chosen United States senator from Indiana. In 1888 he was nominated for president by the Republicans. The campaign turned largely on the question of protection and free-trade, and resulted in Harrison's election over Cleveland by the votes of all the northern states except New Jersey and Connecticut. His administration (1889-93) was an able one, especially in its dealings with foreign questions. Its main features were the Pan-American Congress, held at Washington to promote commerce and more friendly relations between the republics of North and South America; the dispute with Great Britain in regard to the right of the United States to protect the seals in Bering Sea; the McKinley tariff bill, including reciprocity in trade with foreign countries; the dispute with Chile, because of the attack on American sailors at Valparaiso; and the dispute with Italy, because of the lynching of Italians in New Orleans. He was renominated in 1892, but was defeated by Cleveland. He died at Indianapolis on March 13, 1901.

Harrison, Frederic, an English lawyer, publicist and author. He was born at London, Oct. 18, 1831; was educated at King's College, London, and at Wadham College, Oxford. He became professor of jurisprudence for the Inns of Court in 1878, and was a member of the royal commission on trades-unions from 1867 to 1869. He was secretary to the royal commission for the digest of the law from 1869 to 1870, and was a member of the state-trials committee in 1888. He was president of the London Positivist committee, and as such published numerous articles on positivism, and was a voluminous writer in the technical and scientific periodicals. He is the author of *The Meaning of History; Order and Progress; Social Statistics;* a translation of the second volume of Comte's *Positive Polity; The Choice of Books; Oliver Cromwell;* and a large number of lectures on social, historical and religious topics. His later writings embrace a *Life of Chatham; Nicephorus;* a *Tragedy of Modern Rome;* and *Memories and Thoughts*, a volume on men, books, cities and art. In 1906 he received the honorary LL.D. from Cambridge.

Harrison, Mrs. Burton, an American writer, was born near Alexandria, Va., April 25, 1845. Her ancestors took prominent parts in public affairs in colonial times and during the Revolution. She was educated in the private schools of Virginia, and was married in 1867 to Burton Harrison, who removed to New York city and engaged in the practice of the law. Mrs. Harrison's first book, *Goldenrod, an Idyll of Mount Desert*, had for its theme scenes and incidents at Bar Harbor. Several years later she wrote *Bar Harbor Days*. Her later books include *A Daughter of the South, A Bachelor Maid, An Errant Wooing, A Virginia Cousin* and *A Triple Entanglement.*

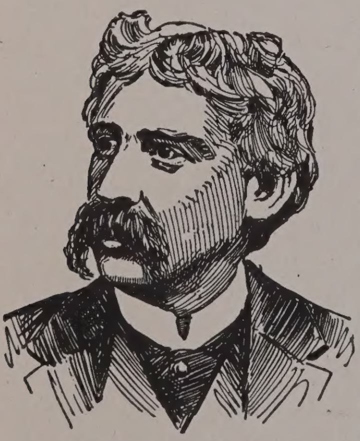
Harrison, William Henry, grandfather of Benjamin Harrison and ninth president, was born in Charles City County, Va., Feb. 9, 1773. His father was one of the signers of the Declaration of Independence, which, as chairman of committee, he reported to Congress on July 4 of 1776. After his father's death William joined the army which Wayne was leading against the northwestern Indians, and showed great gallantry at the battle on the Miami in 1794. He left the army in 1798. He represented the Northwest Territory as a delegate in Congress in 1799-1800, and succeeded in passing an important law relating to the sale of the Federal land in small parcels; and in 1800, when Indiana Territory was formed, which included the present states of Indiana, Illinois, Michigan and Ohio, he was appointed governor. He labored bravely to prevent war with the Indians, but was compelled to quell Tecumseh's outbreak and beat off a fierce and treacherous attack, which ended in an important victory at Tippecanoe on Nov. 7, 1811. In the War of 1812, as chief commander in the northwest, he repulsed the British forces under Proctor, and, aided by Perry's victory on Lake Erie pursued the invaders into Canada, where he totally routed them in the battle of the Thames on Oct. 5, 1813. He was elected to Congress in 1816, becoming United States senator in 1824. In 1828 he went to Colombia as ambassador,

WILLIAM HENRY HARRISON

was recalled in 1829, and for 12 years was clerk in a county-court in Ohio. In 1836 he received 73 electoral votes for the presidency against Van Buren's 170; but four years later, the Whig party having united, he defeated Van Buren, obtaining 234 votes to the latter's 60. He died one month after his inauguration, on April 4, 1841, John Tyler, the vice-president, succeeding him.

Har'row, a great English public school, is located at Harrow-on-the-Hill, Middlesex. The school was founded in 1571 by an English yeoman, John Lyon. At first merely local, in 1660 the school began to attract pupils from a distance. Harrow School has upwards of 600 pupils, whose instruction and discipline follow the Etonian model The great linguist and oriental scholar, Sir William Jones, was educated at Harrow; as were Lord Palmerston, Lord Shaftesbury, Archbishop Trench, Bruce the African explorer, Reel, Admiral Rodney, Byron, Sheridan, Anthony Trollope, Theodore Hook, Merivale and Cardinal Manning. The town has an interesting memorial in the church of St. Mary, said to have been founded by Archbishop Lanfranc.

Hart, Joel T., an American sculptor, was born in Kentucky in 1810. He had very little education, but learned to read by the light of a woodfire, and read everything he could get hold of. While working as a stonecutter in Lexington, Ky., he began modeling busts in clay, and succeeded in making fine likenesses. One of Cassius M. Clay brought him his first order for a bust in marble, and soon after the Ladies' Clay Association of Virginia ordered a marble statue of Henry Clay, which is now in the capitol of Richmond, Va. The colossal bronze statue of Clay at New Orleans and the statue of Woman Triumphant in the courthouse at Louisville, Ky., are his work. He went to Florence, Italy, in 1849, and died there on March 1, 1877. See *Book of the Artists* by Tuckerman.



BRET HARTE

Harte, Francis Bret, an American writer, was born at Albany, N. Y., Aug. 25, 1839. Going out to California in 1854, he tried school-teaching, mining and type-setting in turn. While working in the office of the *Golden Era* in San Francisco, he wrote his first sketches of the mining-regions and people he was familiar with. In this he struck a new vein in literature, and became popular at once, his success gaining him a place as editor on the *Golden Era.* He founded the *Overland Monthly* in 1868, and some of his best stories were contributions to it; such as *The Luck of Roaring Camp*, *The Outcasts of Poker Flat* and *Truthful James.* Returning to the east, he contributed to the *Atlantic Monthly*, and lectured upon pioneer life in California. He was United States consul at Crefeld and Glasgow. After 1885 he lived in London. He wrote a great deal, and showed power in several directions, notably in romances, in *Thankful Blossom*, *Two Men of Sandy Bar*, *A Phyllis of the Sierras* and in the poems *John Burns of Gettysburg*, *Dickens in Camp* and *The Heathen Chinee*, but was most effective in the line of his first work. He died on May 5, 1902.

Hart'ford, the capital of Connecticut, is situated on the right bank of Connecticut River, 50 miles above its mouth and 112 from New York. Since the original Dutch fort of 1633, which occupied the same site, the settlement in 1635-36 by a colony from Massachusetts and its incorporation as a city in 1784, it has risen to the rank of the third city of Connecticut in population. It shared with New Haven the rank of capital up to 1873, when it became the sole capital. It is a handsome city, with fine public buildings and many tasteful private houses. It is perhaps best known for being the headquarters of a number of great insurance companies and of the extensive manufactories of Colt's pistols and gatling guns. Engines, machines, boilers, hardware, stoves and wooden-wares are largely made, and it has a very considerable trade in Connecticut tobacco. It has an imposing state capitol of white marble, a state arsenal and a United States post-office and courthouse. The Wadsworth Athenæum and a fine high-school building are among the other equipments of the city, together with a Congregational theological seminary, a large hospital, asylums for orphans, the deaf and dumb and the insane; and, also, several important libraries. On the city outskirts are the buildings of Trinity College (Episcopal), founded on the present site of the capital in 1823. One of the "sights" of the city for many years was the "Charter Oak," in which, it was said, was hidden the charter of Connecticut, when its surrender was demanded by Governor Andros. Population, 138,000. See *River Towns of Connecticut* by Charles M. Andrews.

Hartford Convention, The, was an assembly of delegates from the New England states, held at Hartford, Dec. 15, 1814, as proposed by the Massachusetts legislature The war with Great Britain (1812–14) had from the first been opposed by the majority of the people of New England, who were Federalists and regarded the war as merely a party measure of the Democrats; and in view of the destruction of the commerce and the fisheries, which were the chief interests of New England, this convention was called to plan means of security and defense. It sat with closed doors for 20 days, and, being supposed to be of a treasonable character, was watched by a military officer of the government. The convention prepared a report, recommending the adoption of measures by the different state legislatures that would protect their citizens from being pressed into the military or naval service by force. No treasonable act was committed, no treasonable intention was proved; yet the suspicion of disloyal tendencies clung to the convention, and completed the ruin of the Federalist party in the election of 1816. Some ground for public suspicion was inferred by the fact that a section of the Federalist leaders who, in 1804 and 1809, had seriously discussed the question of dissolving the Union and forming an eastern confederacy, were foremost in bringing the convention about; the charge, therefore, of aiming at a kingdom of New England was not excuseless. Men of the highest public character who were delegates, however, defended the pure purpose and patriotism of those who took part in the proceedings, and the charges of treasonable designs are now regarded as baseless.

Har'vard University. See UNIVERSITIES.

Har'vest=Moon. Although the moon usually rises later by a considerable interval on each successive night, owing to her motion about the earth, yet the further one goes toward the poles, the greater is the variation in the amount of her retardation. Thus in New York the moon nearest to September 22nd, the autumn equinox, varies in rising only some 25 minutes. This is because she is then in that part of her orbit which makes the least angle with the ecliptic. When a full moon occurs at about this date, it is known as the harvest-moon, because it is very convenient in harvesting to have a rather full moon, lasting almost all night, for several nights together.

Har'vey, William (1578–1657), a distinguished English physician He is one of the epoch-makers in helping to establish the modern method of science, as noteworthy on that account as for his famous discovery of the circulation of the blood. He is likely to be underestimated in the first direction and to be known only for a single piece of work. He graduated from Caius College, Cambridge, in 1597, and went to Padua to study medicine, receiving his diploma there as doctor in 1602. He practiced in London and became a lecturer in the College of Physicians. In his lectures he brought out, about 1619, his views on the circulation of the blood, and these were published in book form in 1628, under the title *De Motu Cordis et Sanguinis* (On the Movement of the Heart and Blood). But Harvey did not actually see the circulation through the capillaries. His conclusions were based on reasoning from anatomical facts Malphighi was the first actually to see, in 1661, with the help of a microscope, the circulation of blood in the lungs of the frog, but Leeuwenhoek, in 1668 and thereafter, made so much more of this line of observation that he deserves greater credit. Harvey was a very original and independent thinker, and made many more observations. He was the first great embryologist. His works were translated from the Latin and published in English by the Ray Society. He was physician at St. Bartholomew Hospital and to the king, attending James I and Charles I. See his *Life* by Willis.

Harz (*härts*) **Mountains,** a range in Germany, extending between the rivers Weser and Elbe, south of Brunswick. This range is 57 miles long and 20 broad, containing an area of 784 square miles, and forms an elevated plateau, rising on most sides somewhat steeply from the plains and ridged with irregular and, in some parts, forest-clad mountains. It is divided into upper and lower Harz, with an average elevation of 2,100 and 1,000 feet each. The Brocken, 3,740 feet in height, is the highest peak of central Germany. The Harz are rich in metals and minerals — as silver, iron, lead, copper, zinc, marble, alabaster and granite — and the industries connected with the mines and forests, as well as some cattlebreeding and agriculture, afford employment to the inhabitants, while the rearing of singing-birds is also a source of profit. These mountains form a natural line of division between the low and high German races, and are the scenes of many weird legendary tales in German literature.

Hasdrubal (*hăs'drö-bal*) was the name of several Carthaginian generals, of whom the most famous was the son-in-law of Hamilcar and brother-in-law of Hannibal. Hasdrubal accompanied Hamilcar into Spain in 237 B. C., and gave effective aid in the building up of a Carthaginian dominion in that peninsula. On the death of Hamilcar, 228 B. C., Hasdrubal ruled the new empire and advanced its frontier from the Guadalquivir to the Tagus, and founded a new capital, the modern Carthagena. He was very successful in conciliating the Iberian tribes, and mainly extended his rule by peaceful means. The Roman treaty fixing the frontier line at the Ebro was made with Hasdrubal — not with Carthage — so independent was he of the home government. He was assassinated by a Celtic slave in 221 B. C. Another Hasdrubal was Hannibal's own brother.

Hashish (*hăsh'ēsh*), a preparation of Indian hemp. The drug is used in the east in various ways. Sometimes it is smoked alone or with tobacco; at other times beverages are prepared from it or it is taken in the form of lozenges; or it may be taken as a medicine in the form of a resinous extract or tincture. The effects of hashish differ according to the dose or the constitution of the person using it. Some become quarrelsome; others are lost in reverie. Small doses are apt to produce causeless merriment. The unpleasant after-effects of opium seem to be different, but the hashish habit has the same evil results which follow all such indulgences.

Hastings (*hâs'tĭngz*). The battle to which this name is usually given was fought at Senlac, near Hastings, between the English under King Harold and the Norman invaders under William the Conqueror on Oct. 14, 1066, the former being completely defeated. From that fatal day until now the place has been called Battle Hill. This battle, by which the Norman conquest of England was accomplished, is one of the fifteen decisive battles of history. Hastings is in Sussex County on the English Channel, sixty miles southeast of London. In 1931 the population was 65,199.

Hastings, a city and the seat of Adams County, Nebraska, is situated about ninety miles west by southwest of Lincoln. The city has extensive brickyards, flourmills, lumberyards, foundries, sash and door factories, a cold storage plant and a packing house. Among its principal manufactures may be included brooms, cigars and automobile pumps. Hastings is situated in the heart of a thriving agricultural and livestock region.

The public buildings of the city include the courthouse, city hall, opera house, Masonic temple, and the State asylum for the insane. Hastings College and Academy and a Young Men's Christian Association are also situated here. The city has a well developed system of education.

In 1930 the population was 15,490.

Hastings, Warren, a distinguished British statesman was born at Churchill in Oxfordshire, England, on December 6, 1732. In 1750 he went out in the civil service of the East India Company, and was at first employed in Calcutta. He was in the country at the time of the Black Hole tragedy, but made his escape, joining the refugees at Falta Ghat, returning to England in 1764. In 1769 he returned to India as second-in-council at Madras, proceeding in 1772 to Bengal, where he was promoted to the presidency of the council. A year later the British Parliament passed the Regulating Act, under which Hastings was to be governor-general at a handsome salary and to be assisted by a council of five members—three of them appointed from home. This began the trouble. The majority in council, led by Sir Philip Francis (1740-1818), were opposed to Hastings from the first. The finances were in great disorder; and the demands of the Company for remittances were frequent and urgent. Hastings made many internal reforms, and increased the territory and the revenues of the Company. Resigning in 1784, he returned to England, and soon was summoned before Parliament for trial. The charges were mainly of giving aid and money to the native princes and of receiving bribes. The interest at first was very great and the eloquence of Burke, Fox and Sheridan drew large crowds. Many felt, however, that Hastings' public services overbalanced any mistakes he had made. He had prevailed in war, left Bengal in peace and founded an empire which no one thought of giving up. The famous trial lasted seven years, and of the original members of the house of lords who were present when Hastings was called to the bar, only 29 were left to give the final vote of acquittal (1795). He had spent his large property in his defense, and was supported during the remainder of his life by the East India Company. He died on August 22, 1818.

Hattiesburg (*hăt'ĭz-bŭrg*), a city and the seat of Forrest County, Mississippi, is situated on the Leaf River. Hattiesburg is famous throughout the United States as one of the largest yellow-pine centers in the south. The city has railway shops, a cotton compress, wood-reduction plant, and machine shops. The principal manufactures are lumber products, fertilizers, and mattresses. The Mississippi Normal College, and the Baptist Woman's College are situated here. In 1930 the population was 18,601.

Hauptmann (*houpt'män*), **Gerhart Johann Robert,** a distinguished German poet and dramatist, was born in the Silesian village of Oberzalzbrunn on November 15, 1862. His father, Robert Hauptmann, was proprietor of a prosperous inn, *Zur Preussischen Krone.* Young Gerhart was educated in the village school, and although he had not proved a very apt pupil, he was sent to the *Realschule* at Breslau in 1874. His two older brothers, Carl and Georg, had already achieved fame in literature and art, and it was in this atmosphere that Gerhart came to live in Breslau. Just four years later, young Hauptmann's father suffered financial losses and found it necessary to remove his son from school. The boy was sent to live with a pious uncle and Gerhart found himself in a new environment; this time he was expected to attach himself to the soil.

At the age of eighteen the lad entered the Royal College of Art in Breslau. In 1882 he joined his brother Carl at the University of Jena. There he studied zoölogy under Haeckel and philosophy under Professor Rudolf Eucken. He soon tired of the student's life, however, and set out upon a tour through Spain and Italy. It was during these travels that he developed his peom *Promethidenlos,* which was modelled on *Childe Harold.*

In 1884 Hauptmann journeyed to Italy and there occupied a sculptor's studio in Rome. It was while here that he became ill with typhoid fever. During his illness his nurse and constant companion was Marie Thienemann. They later travelled to Germany together and

Hauptmann recuperated from his illness in the Thienemann country home. Later in that same year Hauptmann and Fraulein Thienemann were married.

About this time Hauptmann decided to abandon his sculpturing and devote himself to the stage. After reaching Berlin he became interested in writing and in 1885 produced the finished *Promethidenlos.* A short time later *Das Bunte Buch* appeared, a collection of poems. In 1887 he produced *Bahnwarter Thiel,* an episodic story.

It was during these years in Berlin that Hauptmann became associated with Arno Holtz, the exponent of "consistent naturalism." He was soon enveloped in a new social and political circle the members of which advocated social reform and the development of realism in literature and on the stage. Hauptmann's home soon came to be a gathering place for this group.

Hauptmann, the German poet, became Hauptmann, the prominent dramatist in 1889. In that year there appeared his *Vor Sonnenaufgang* (*Before Dawn*), a drama in which the drastic need of social reform was displayed. Three years later his *Die Weber,* the most famous of his works, was presented privately. The drama carries the reader through the rise and fall of a revolution, vividly displaying the "uncompromising realism" which characterized its author. In 1893 a new type of drama was produced by Hauptmann, *Hanneles Himmelfahrt* (*Hannele*), a work which combined realism with the poetic mysticism of a child's dream. In 1896 *Die Versunkene Glocke* (*The Sunken Bell*), a poetic allegory was published. In the years which followed Hauptmann had developed a spirit of German naturalism and voiced beliefs and expressions which often vexed political parties. Among his later social dramas are *Der Biberpelz* (*The Beaver-cape*); *Der rote Hahn* (*The Red Cock*), and *Ratten* (*The Rats*). In 1905 Hauptmann received an honorary degree from Oxford University. In 1912 he was awarded the Nobel Prize for Literature. His famous novel, *Atlantis* was published in this same year. During the World War he produced *Winterballade* (1917), a dramatic work dramatizing a short story by Selma Lagerlöf. Among his later works are *Anna,* rural epic (1921); *Phantom* (1922); *Die Insel der grossen Mutter,* a novel (1924); *Dorothea Angermann* (1926); *Till Eulenspiegel* (1927), and *Wanda,* a novel (1928).

Hauser, Henri, a distinguished French historian and economist, was born at Oran, Algeria. After completing his education he became professor on the faculty of letters in the Sorbonne. In 1922-23 he was the French visiting professor at Harvard University. There he lectured on the history of capitalism. Professor Hauser is recognized as an authority on the economic history of the later Middle Ages and the Renaissance.

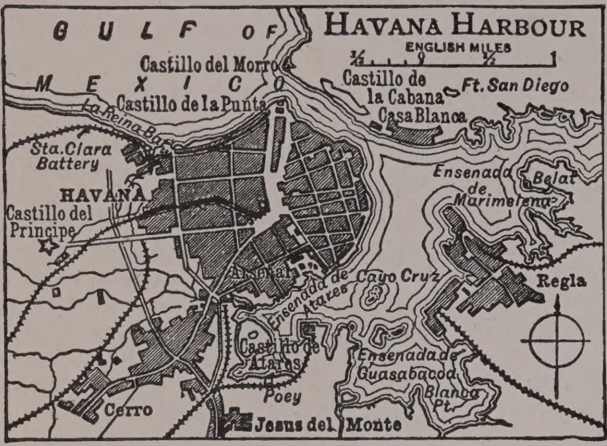
Among his most important works are *François de la Noue* (1893); *Economic Germany* (1915); *Germany's Commercial Grip Upon the World* (1917); *Travailleurs of marchands dans l'ancienne France* (1920); *La Nouvelle orientation economique* (1924), and *Les debuts du capitalisme* (1927).

Hausmannite (*hous'măn-īt*), a native oxide of manganese which crystallizes in the tetragonal system. It is a black ore having a submetallic lustre. It is found in Thuringia, Sweden, and the Harz District of Germany.

Haussmann (*ōs'män'*), **Georges Eugene,** a famous French statesman, was born at Paris, on March 27, 1809. He entered the service of the state under Louis Philippe, and under Napoleon III became prefect of the Seine. While holding this office, his reputation was made by his improvement of Paris through widening streets, laying out boulevards and parks and building sewers, barracks, bridges and other public works. The beauty of modern Paris is largely due to Haussmann. He was rewarded for his work with the title of baron; but the enormous expenditure of over $175,000,000 was complained of by the citizens, and he was dismissed from office. "Haussmannizing" is a term now used for the reckless destruction of old buildings to make way for new improvements. He departed from France after the fall of the Empire, but later returned and was elected to the Chamber of Deputies in 1877. Boulevard Haussmann has been named in his honor. Baron Haussmann died at Paris, on January 11, 1891.

Haustoria (*hôs-tō'rĭ-ȧ*), a botanical term applied to the processes of various kinds sent out chiefly by parasitic plants for absorbing nourishment. In the case of surface parasites the haustoria penetrate the host and absorb its nutrition. In the case of internal parasites the haustoria penetrate the living cells and suck out their fluid contents. Naturally, haustoria are chiefly developed by the fungi, the group which has cultivated the parasitic habit more than any other. The mistletoe, however, is an example of a seed-plant which sends haustoria into the limbs of the trees upon which it grows. The singular is haustorium.

Havana (*hȧ-văn'ȧ*), or **La Habana,** the capital city of Cuba, and the principal center of commerce in the West Indies, is situated on the north side of the island on a peninsula bounded by the Gulf of Mexico and the Bay of Havana. Its magnificent, well-sheltered harbor is entered through a channel 350 yards wide, the entrance to which is defended by several forts. The streets of the older part of the town are narrow and dirty, and the harbor before the American occupancy was polluted by the town sewage. The modern portion of Havana, lying to the west, is joined to the older section of the city by broad, tree-shaded avenues and gardens. The houses, which are low, are solidly built of stone, with flat roofs. The broad verandas and barred windows which reach to the ground are gay with paint and white marble decorations. The noteworthy public buildings are the cathedral, built in 1724 in the old Spanish style, which for a century and more contained, it was said, the bones of Columbus; and the *Beneficencia*, which, besides being a hospital, includes an orphan asylum, a lunatic asylum and a poorhouse. The main industry is the manufacture of cigars. Sugar, cigars and tobacco are the staple products and the most important of the exports, which also include molasses, rum, wax, iron ore and honey. The chief imports are rice, flour, lard, jerked beef, codfish and coal, besides iron and steel work. Diego Velasquez originally founded Havana on the south coast in 1515, but four years later it was transferred to its present site. In the course of its unfortunate history it has been burned to the ground by buccaneers (1528); plundered in 1555 by another band; captured by a third in 1563; and by the English in 1762. In the 17th century, however, it was made the chief center of Spanish trade in the West Indies and the harbor for the Spanish gold fleets. Population 555,178.

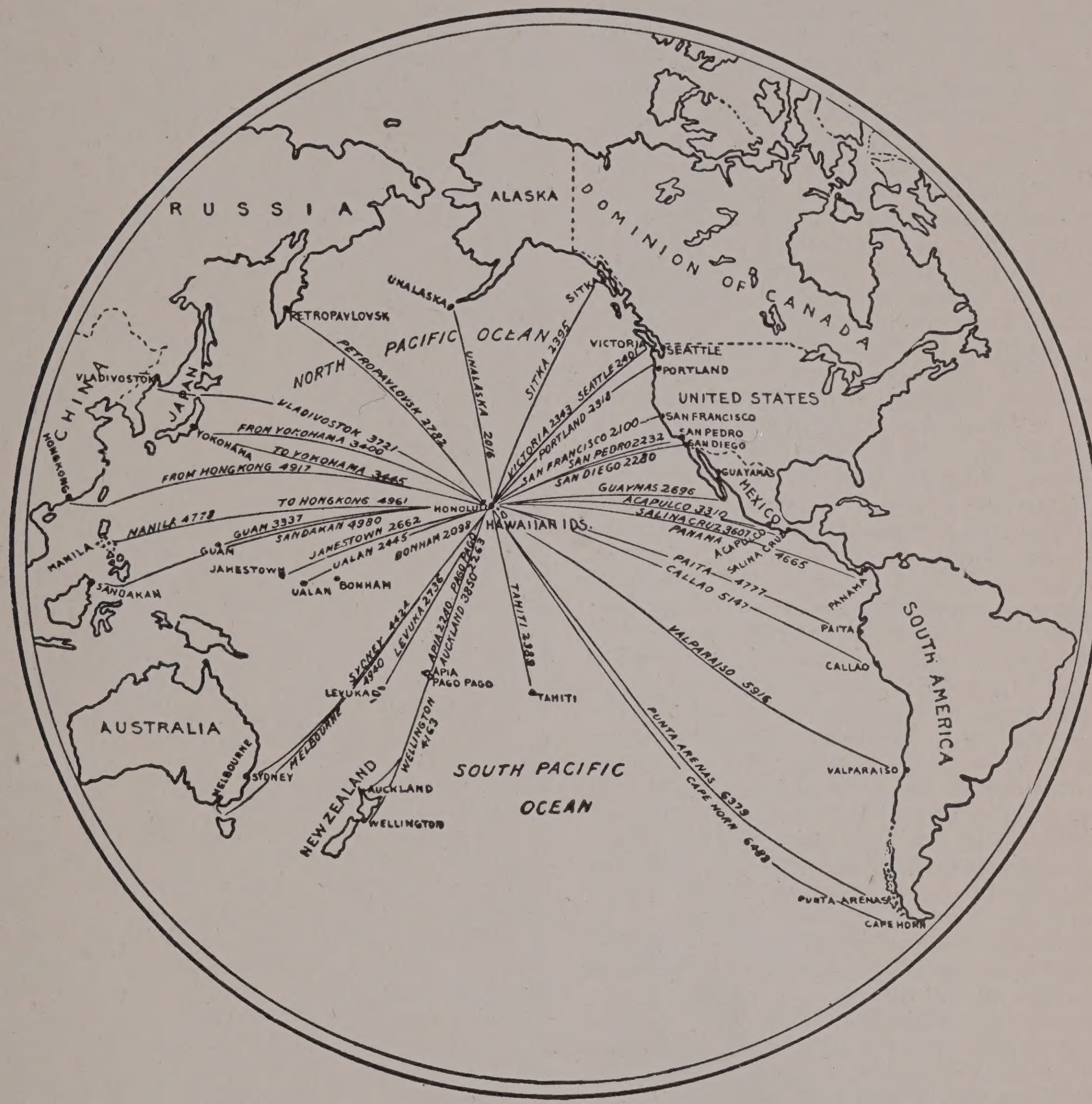


Hav′elock, Sir Henry, one of the English heroes of the Indian mutiny, was born of Danish descent in Durham, England, April 5, 1795. He entered the army in 1815. He was ordered to India in 1823. During the voyage he met with the religious experience which colored all his after-life. Havelock distinguished himself both in the Afghan and the Sikh war, but was only a lieutenant after 23 years' service. When news came, in 1856, of the Indian mutiny, he organized a column at Allahabad, and marched to the relief of the British at Cawnpore and Lucknow. After a forced march with his 2,000 men, he reached Fattehpúr, where he broke the rebel force and, continuing his march to Cawnpore, drove the enemy before him. At the instigation of the infamous Nana Sahib, the miscreants revenged their defeats, before abandoning Cawnpore, by massacring all the defenseless women and children in their hands. Havelock now advanced upon Lucknow. Crossing the Ganges, he fought eight victorious battles, which, together with fatigue and sickness, so thinned his little army that he was obliged to retire upon Cawnpore. General Outram arriving early in September with re-enforcements, Havelock again advanced to Lucknow, and after desperate fighting relieved the beleaguered garrison. The victors were now also besieged until November, when Sir Colin Campbell (afterward Lord Clyde), in his turn, forced his way to their rescue. After the relief of Lucknow, Havelock was attacked by dysentery, and died on Nov. 24, 1857. He was a Christian hero and one of England's noblest soldiers. See *Biographical Sketch* by Brock and *Memoir* by Marshman.

Haverhill (*hā′ver-ĭl*), **Mass.,** is situated at the head of navigation on the Merrimac, 33 miles north of Boston. The chief industry is the manufacture of boots and shoes, in which it is second only to Lynn and gives employment to about 6,000 men in 200 factories; there also are factories for glass, hats, iron, boot and shoe findings and factories for the cut stock. The public schools rank high, and, besides, there are parochial schools, a Brothers' school (R. C.) and Bradford Academy for young ladies, established in 1804. Noteworthy public buildings include the public library, founded in 1875. It contains 100,000 volumes, and has been generously supported by E. J. M. Hale. Hale Hospital and the Y. M. C. A. building should also be mentioned. The Whittier homestead, birthplace of the poet and scene of *Snowbound*, is but three miles from the heart of the city. The house and its surroundings are owned by the Whittier association. Haverhill was settled in June, 1640, under the name of Pentucket and is a center of historical interest. Population, 60,000.

Havre (*hä′ver*), a seaport on the northern shore of France, situated north of the mouth of the Seine and, next to Marseilles, the largest shipping center in France. It also is the port from which the larger part of French emigrants set sail. Down to 1516 Havre was but a fishing village, Francis I having built its harbors and fortified it. Population 136,159.

Hawaiian (*hä-wī′yan*) or **Sandwich Islands,** a small archipelago in the northern Pacific, until lately forming the kingdom of Hawaii and named Sandwich Islands by Captain Cook. They are eight in number, and form a beautiful group, running from southeast to northwest — a territory now of the United States. The capital is Honolulu (pop. over 50,000) on the southwest coast of the island of Oahu. For military purposes the islands are attached to the department of California. The Hawaiian Islands lie in the course of vessels bound from San Francisco to China, Japan, New Zealand and Australia, and afford a very convenient coaling station. They are of volcanic formation, many of them bordered, though not surrounded, by coral reefs. The larger islands are mountainous, and Hawaii, the largest, contains the high mountains of Mauna Kea (13,805 feet) and Mauna Loa (13,675 feet). The area and population of the several islands are as follows: Hawaii 4,210 square miles (pop. 55,382); Maui 760 square miles (pop. 25,416); Oahu 600 square miles (pop. 82,028); Kauai 590 square miles (pop. 23,952); Molokai 270 square miles; Lanai 150 (pop. of the two isles, 2,504); Nihau 97 square miles (pop. 172); and Kihulaue 63 square miles. The total area is about 6,640 square miles; the total population 300,000. There are many Japanese, Chinese and Koreans on the islands; but English is the language in general use in the schools. The natives are chiefly Christians.



Climate and Products. The climate is fairly temperate, the mercury seldom rising above 90° F. and, in the cooler season, rarely falling below 52°. The valleys are beautiful and highly fertile, and are covered with sugar, cotton and rice plantations. The commerce of the islands is gradually increasing.

Exports. In 1876 a reciprocity treaty was concluded with the United States, which led to an enormous development of the sugar-export trade. The other chief articles of export are rice, wool, molasses, tallow and bananas.

History. The islands are said to have been found by Gaetano in 1542, and were rediscovered by Captain Cook in 1778. Formerly each island was governed by a separate king, but early in the 19th century, under Kamehameha I, they were united into one kingdom, whose ruler was vested with almost absolute power. This so remained until about 1886, when the powers of the king were greatly curtailed. Another Kamehameha, who died in 1874, was succeeded by Kalakaua. The latter died in 1891, and was succeeded by Queen Liliuokalani, who was deposed in January, 1893. The republic of Hawaii was proclaimed on July 4, 1894, and annexation to the United States was sought. After four years a treaty of annexation was passed by congress, and on July 7, 1898, the islands became a part of the United States.

The strategic value of the Hawaiian Islands to the United States is supreme. Lying within easy steaming distance of our Pacific coast, they afford a point from which the whole North Pacific Ocean can be patrolled by cruisers and the commerce of the Panama Canal be protected. In 1893 our greatest authority on seapower and naval strategy, Capt. A. T. Mahan, wrote in reference to the proposed annexation of Hawaii: "To any one viewing a map that shows the full extent of the Pacific two circumstances will be strikingly and immediately apparent. He will see at a glance that the Sandwich Islands stand by themselves in a state of comparative isolation amid a vast expense of sea; and, again, that they form the center of a large circle whose radius is approximately the distance from Honolulu to San Francisco. To have a central position such as this and to be alone, having no rival, are conditions that at once fix the attention of the strategist. But to this striking combination is to be added the remarkable relations borne to the great commercial routes traversing this vast expanse. It is rarely that so important a factor in the attack or defense of a coastline — of a sea-frontier — is concentrated in a single position, and the circumstance renders it doubly imperative upon us to secure it if we righteously can." The situation will be clearly seen from the map here given. See, also, PEARL HARBOR.

Government. The islands were organized as a territory of the United States; the new territorial government was inaugurated at Honolulu, June 14, 1900; and the first territorial legislature began its sessions at Honolulu on February 20, 1901. See Miss Bird's *Six Months in the Sandwich Islands.*

SPARROW-HAWK

Hawk, a common name for birds of prey related to the falcons. These two kinds of birds are often confused. The falcons have a tooth on the upper bill, while the hawks have not. They are found all over the world and about 70 species are recognized. Their wings are shorter than those of the best falcons. Hawks nest alone, not in colonies. They are abundant in the United States; in North America above Mexico there are about 34 species. The sparrow-hawk, pigeon-hawk and duck-hawk stand in a distinct group, belonging to the falcons. The first-mentioned, the smallest American hawk, is an attractive bird and of much usefulness, destroying innumerable grasshoppers and a great many mice. It is a little longer than the robin, its back reddish brown and black, its breast spotted with black. It is found in almost all portions of country. The pigeon-hawk, only a trifle larger than the preceding, dull blue or brown above and lighter below, is very destructive to song-birds and of little use to man. The duck-hawk, above a dingy black and light below, also is a bird that deserves no protection, feeding largely on poultry and game-birds. Other common culprits among hawks are the sharp-shinned and Cooper's, both found throughout the United States. The sharp-shinned hawk is small in size, blue-gray above and white below; has a slender body, long legs and tail; and flies very swiftly. It feeds almost exclusively on song-birds. Cooper's hawk closely resembles the preceding one in form and color, but is considerably larger. It is of great strength and boldness; its flight is strong and rapid; its prey poultry and game-birds, as grouse, quails, pigeons. In Canada the American goshawk is a dreaded enemy of game-bird and poultry, and deserves no mercy. This bird has a black head, is blue-gray above and white below.

To turn now to the hawks that merit protection, mention should first be made of the two that have undeservedly been given a bad name, the red-shouldered and the red-tailed hawk — both mistakenly called hen-hawk and chicken-hawk. The former, one of our commonest hawks, is about 18 inches long, is rusty brown in color, and has a black tail marked by bands of white. Mice are its chief food, but it feeds also upon grasshoppers and other insects, and eats frogs, toads, reptiles etc. It does not kill many birds. The red-tailed hawk is larger than the preceding one. This bird Hornaday classes as "the greatest of all destroyers of noxious four-footed animals." Although it sometimes preys upon poultry, less than ten per cent. of its food consists of game-birds and poultry. Far the greater part consists of destructive rodents. The marsh-hawk, familiar on the prairies, has long been appreciated for his service in ridding the land of pests. It may easily be recognized by the large patch of white, low on its back. To avoid making way with a bird of much benefit, it is recommended that the indiscriminate shooting of hawks be discouraged. See FISH-HAWK.

Haw'kins, Anthony Hope, Sir, an English writer known under his pen-name of Anthony Hope, was born near London in 1863. He took a degree at Balliol College, Oxford, in 1880. His first attempt in literature was *A Man of Mark. Father Stafford* followed, and was regarded as a failure. *Mr. Witt's Widow* and a series of magazine-stories were partially successful. In 1893 *A Change of Air* and *Half a Hero* were published. The same year his first substantial success came with *The Prisoner of Zenda.* Following closely upon this came the *Dolly Dialogues* and, a little later, *The God in the Car, Comedies of Courtship* and *The Indiscretion of the Duchess.* In 1896 *The Heart of Princess Osra* was published; in 1897 *Phroso;* in 1898 *Simon Dale, Rupert of Hentzau* and *Lady Ursula.* Among his later stories is *Sophy of Kravona.*

Hawkins, Sir John, an English sailor, was born at Plymouth about 1532. He enjoys the unhappy notoriety of having been the first Englishman to engage in the slave-trade (1562). His career as a slave-trader ended in 1567 with his third voyage. He was made treasurer of the navy in 1573, and knighted in 1588 for his able services against the Spanish Armada. In 1595 he was in joint command of an expedition against the settlements in the Spanish Main, but died at sea off Porto Rico on Nov. 12. See Hakluyt's *Voyages* and Kingsley's *Westward Ho.*

Hawk-Moth, any one of a group of moths (sphinxes) with a stout, spindle-shaped body and long, narrow, strong wings. The sucking-tube is very long, in some cases being twice as long as the body; when not in use it is closely coiled like a watch-spring beneath the head. These moths are seen at twilight hovering over a flower like humming-birds, and therefore are sometimes called humming-bird moths. There are several varieties to which the name belongs. The larvæ are usually large; the best-known one is the tomato-worm. The tobacco-worm also is the larvæ of one of the hawk-moths.

Haw'ley Joseph Roswell, was born at Stewartsville, N. C., Oct 31, 1826. In his childhood his parents removed to Connecticut. He studied law, but abandoned the profession to enter journalism, and in 1861 entered the army as a volunteer. He took part at Bull Run, Port Royal, Fort Pulaski, James Island and Pocotaligo, being brevetted major-general for gallant conduct. He commanded a division at the siege of Charleston and the capture of Fort Wagner. In 1866 he was elected governor of Connecticut, and in 1872 was elected to Congress and soon became a leader on the Republican side of the house. From 1873 to 1877 he was president of the United States Centennial Commission. In 1881 he was elected to the senate, and became a leader in all questions of party politics. He died on March 18, 1905.

Haw'thorne, Julian, an American author, the son of Nathaniel Hawthorne, was born at Boston, Mass., June 22, 1846. He studied at Harvard but did not graduate, leaving that institution to study engineering at Dresden. During the Civil War he was a member of the staff of Gen. McClellan, engaged at work on the New York docks, remaining in this service until 1872. During this period he wrote several short stories for American magazines, and, these proving popular, he turned his attention to literature. He returned to Germany, and in 1873-4 published *Bressant and Idolatry. Garth; Sebastian Strome; Fortune's Fool; Noble Blood;* and *Dust* followed. Meantime he wrote short stories, *A Fool of Nature* gaining the ten-thousand-dollar prize offered by the New York *Herald* in 1896. Hawthorne is an author of several detective stories. He has written many critical papers, and has prepared a text-book on *American Literature. Archibald Malmaison* is another of his well-known works. His miscellanies are very numerous.

Hawthorne, Nathaniel, a distinguished American novelist, was born at Salem, Mass., July 4, 1804. He was the grandson of Daniel Hawthorne, who was commander of a privateer in the Revolutionary War. His father, like many of the other male members of the family, was a follower of the sea, and died when the son was but four years old. He graduated from Bowdoin College in 1825 with Longfellow. His first novel, *Fanshawe,* was published anonymously (1828), but proved a failure. The first book to bring fame was a collection of short stories, called *Twice-told Tales* (1837). In 1850 *The Scarlet Letter,* the book which made his name most widely known, was given to the public. Quickly upon this followed *The House of Seven Gables, The Wonder-Book, The Snow-Image, The Blithedale Romance, Tanglewood Tales* and a continuation of *The Wonder-Book* (1853). He was known as one of the most brilliant contributors to the magazines of his day. In March, 1853, he was appointed consul to Liverpool by President Pierce, and remained until the close of 1857. He then spent a year in Italy, which inspired *The Marble Faun* (1858), returned to America, and published *Our Old Home* (1860), sketches of England. He died at Plymouth, N. H., May 19, 1864. Hawthorne is undoubtedly the greatest of American novelists. See *Hawthorne* by Prof. Geo. E. Woodberry, in the series of American Men of Letters, and *Nathaniel Hawthorne* by Julian Hawthorne.

NATHANIEL HAWTHORNE

Hay, John, an American writer and diplomat, was born at Salem, Ind., Oct. 8, 1838, and was educated at Brown University. He was admitted to the bar in Illinois in 1861, and became secretary to President Lincoln. He also held the military rank of major and was brevetted lieutenant-colonel. After the war he was successively secretary of legation at Paris, *chargé d'affaires* at Vienna and secretary of legation at Madrid. From 1870 to 1875 he was on the staff of the New York *Tribune*. He published *Pike County Ballads* and *Castilian Days*. With John G. Nicolay he wrote *The Life of Abraham Lincoln*. He became ambassador to Great Britain in 1897, and in 1898 was made secretary of state by McKinley. He helped negotiate the Hay-Pauncefote (see CLAYTON-BULWER) treaty giving the United States sole authority to build the Panama Canal. He won for American diplomacy a commanding position, and for himself a high place as an advocate for peace based upon international candor and fair dealing. He died July 1, 1905.

JOHN HAY

Haydn (*hā'd'n*), **Joseph,** a German composer, was born in the village of Rohrau, on the border of Hungary and Austria, March 31, 1732. He was the son of a poor wheelwright, but early developed decided musical genius. At the age of eight he was received into the choir of the cathedral of St. Stephen in Vienna, but ten years afterward his voice broke and he lost his position. Thereafter, for some time, he lived in great poverty, earning a small sum by street-playing and serenading, until he hoarded enough to hire an attic and a piano, when his most strenuous studies began. The first recognition he received was from Herr Kurz, a theatrical manager, who heard him playing one of his own compositions under his window and commissioned him to write an opera. His musical theory was directly opposed to that of J. S. Bach and Handel. His first quartet for stringed instruments was written in 1750 and his *Creation* and *The Seasons* in 1795–96. He died on May 31, 1809. His compositions are exceedingly numerous, comprising over 600 in number. See Miss Townsend's *Life of Haydn*.

Hayes, Cardinal Patrick J., of New York, was born in 1867. He was ordained a priest in 1892, and was made Chancellor of New York in 1893. For a period of eleven years from 1903 to 1914 he ably acted as president of Cathedral College, New York. He has served as domestic prelate to the Pope. In 1914 he was consecrated Auxiliary Bishop and in 1919 Archbishop of New York. During the World War he was Catholic Bishop for the United States Army and Navy. He was made a member of the College of Cardinals in 1923.

Hayes, Rutherford Birchard, nineteenth president of the United States, was born at Delaware, O., Oct. 4, 1822. He graduated at Kenyon College, Ohio, in 1842, and, after studying law at Harvard, practiced at Cincinnati from 1849 to 1861. During the Civil War he served with distinction and attained the rank of brevet major-general. He was sent to Congress in 1865, and was three times governor of Ohio. In 1876 he was the Republican candidate for president, Samuel J. Tilden being the Democratic candidate. The election developed many exciting complications and engendered great suspicions of unfairness. Congress appointed an electoral commission, which gave the office to Hayes by a vote of eight to seven. Under Hayes' administration the country recovered to a large extent from the financial panic of 1873. The two main features of his policy were civil-service reform and the withdrawal of United States troops from the south. See his *Life* by W. O. Stoddard. He died at Fremont, O., Jan. 17, 1893.

RUTHERFORD B. HAYES

Haynes, Elwood (1857–1925). From the time he was a small boy, Haynes was interested in chemistry, and at the age of fourteen began mixing metals. At the Worcester Polytechnic Institute he made the first tungsten chrome steel in 1881, the year he was graduated. This is called "high speed steel," because it is so hard it will not melt under the heat of friction. In 1897 he made the now famous alloy of chromium and nickel. As manager of the Indiana Natural Gas and Oil Company he became interested in the "horseless carriage," invented one exhibited July 4, 1894, at Kokomo, Indiana, and became president of the Haynes Automobile Company in 1898. He was the first to use aluminum in making an automobile engine, the first to invent the rotary valve gas engine, and the discoverer of "stainless steel" in 1911.

Hayne, Robert Young, an American statesman, was born in South Carolina in 1791, admitted to the bar in 1812, served in the war with Great Britain, and at its close resumed his law-practice in Charleston. He was a member of the state legislature, afterward its speaker, and from 1818 to 1822 attorney-general of the state. During 1823–32 he was United States senator, and proved a great enemy of protection and a bold supporter of the doctrine of nullification or the alleged right of a state to prevent the carrying out of a law that is considered not according to the Constitution. One of Webster's ablest speeches was made in reply to Hayne, when he advocated this doctrine. In 1832 he was elected governor of South Carolina. He died at Asheville, N. C., Sept. 24, 1839.

CHARLES M. HAYS

Hays, Charles M., was born at Rock Island, Illinois, 1856. He entered railway service in 1873 as a clerk in the passenger department of the Atlantic and Pacific Railway. He was general manager of the Grand Trunk Railway from 1896 to 1901, and became vice-president. He is president of the Central Vermont Railway, the Canadian Express Company, the St. Clair Tunnel Company, and the International Bridge Company.

Haz'ard, Miss Caroline, president of Wellesley College, was born at Peace Dale, Rhode Island, in 1856. Her education was private, and was in part received in Europe from private tutors. Prior to her election to the presidency of Wellesley in 1899, Miss Hazard was known chiefly as the author of *Narragansett Ballads* and *The Narragansett Friends' Meeting*. She received the degrees of A. M. from Michigan and of Litt. D. from Brown.

Ha'zel, species of *Corylus*, a genus belonging to the birch family. The genus contains about seven species distributed throughout the northern hemisphere, three of which occur in the United States. The ordinary hazel, which often makes extensive thickets and produces the common wild hazelnut, is *C. Americana*. The beaked hazelnut (*C. rostrata*) is a fruit from a shrub extending from the northern part of North America south along the mountains. The third species occurs in California.

Ha'zleton, Pa., a city in Luzerne County, in an anthracite-mining district, southwest of Wilkes-Barre and 100 miles northwest of Philadelphia. It occupies an elevated position in an attractive section of the country, on the Lehigh Valley and Pennsylvania railroads. It has trolley connection with outlying villages, that within a ten-mile radius give a population of 30,000, and a third-rail electric road establishing hourly communication with Wilkes-Barre. The chief industry of the section is coal, though the town has a number of manufactories of various kinds and has a large local trade. There are a miners' hospital and a state hospital. It has a number of beautiful churches, fine public school buildings and an excellent public library. Population, 40,000.

Head (in plants), an inflorescence in which the flowers are brought together in a compact head-like cluster, as in the buttonbush, dandelion, sunflower, etc. It is the typical flower-cluster of the great composite family. See INFLORESCENCE.

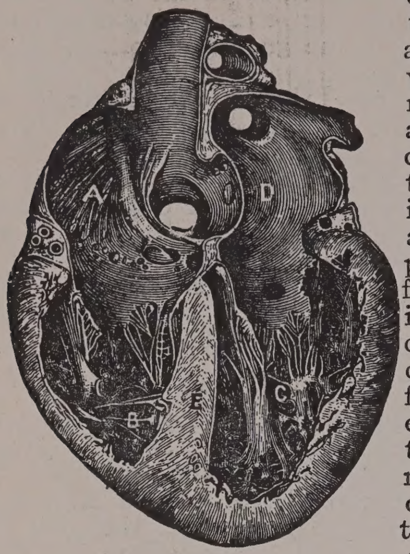
Head'ley, Joel Tyler, an American author, was born at Walton, N. Y., Dec. 30, 1813. He graduated from Union College in 1839, studied theology at Auburn Theological Seminary, and became pastor of a church at Stockbridge, Mass. But ill-health soon compelled him to abandon pastoral work. He became well-known by such historical and popular works as *Napoleon and his Marshals* and *Washington and his Generals.* He died on Jan. 16, 1897.

Hear'ing. See EAR.

Hearst, William Randolph, was born in San Francisco, April 29, 1863. He studied at Harvard, but did not graduate. In 1886 he gained possession of *The Examiner* of San Francisco, a paper that then was on the verge of failure, and quickly made it a financial success and a widely read newspaper. In 1895 he became proprietor of *The Journal* (now *The American*) and *The Evening Journal*, of New York City. He later established *The Chicago American* and *The Examiner*, and now has a chain of many daily newspapers extending from the Pacific coast to New England. He represented the 11th New York Congressional district in the 58th and 59th Congresses. In 1905 and in 1909 he ran for mayor of New York City, but was defeated. In 1906 he was nominated by the Independence League for governor of New York, and his candidacy was endorsed by the Democratic party, but he failed of election. Under his leadership, in 1908, a convention of the Independence League was held in Chicago, and Thomas L. Hisgen was nominated as its candidate for the presidency.

WILLIAM R. HEARST

Heart, the organ that propels the blood. A pulsating organ for this purpose is found in worms, insects, the crayfish, snails and other invertebrate animals. In its simplest form it is a pulsating tube with muscular walls that contract rhythmically. In vertebrates there is considerable variation in the heart of fishes, amphibia, reptiles, birds and mammals. In adult fishes the heart consists of two chambers — an auricle and a ventricle — the blood entering the first and passing into the second, from which it is pumped into the aorta and through its branch. In frogs and toads the heart has three chambers—two auricles and a single ventricle. In reptiles there are three chambers, but the ventricle is divided by an imperfect partition, foreshadowing the four-chambered condition found in higher animals; in the highest reptiles (crocodile) this partition becomes complete. In birds and mammals the heart has two auricles and two ventricles. The right auricle and ventricle receive venous blood and the left ones arterial blood. These facts, based on comparison of the hearts of different animals, become more interesting when it is known that the heart of the highest animal starts, in the embryo, as a single chamber and from that condition passes through all changes up to the four-chambered heart. For example, the heart of the young chick arises after the egg has been incubated two days, and on the third day its beating can be easily seen on opening the egg. At its beginning it is simply a tube with muscular walls formed by the union of two veins. It becomes twisted into an S-shaped, then into a U-shaped tube; it enlarges and the walls get thicker, it then has auricles developed upon it; and by a series of complicated changes it becomes two-, three- and finally four-chambered.



SECTION OF THE HUMAN HEART
(*a*) right aurical; (*b*) right ventrical; (*c*) left ventrical; (*d*) left auricle; (*e*) partition.

Very early in their development the arteries leaving the heart are built on the fish-like type and undergo a remarkable reduction and transformation. These changes furnish clues as to former conditions which help naturalists to read the past history of animals. The heart of the human body also undergoes similar changes. When fully formed, it consists of two auricles and two ventricles, and the right and left cavities are separated by a muscular partition. (See illustration.) The blood is brought from the body to the right auricle and passes through an aperture guarded by valves into the right ventricle; from here it is sent out on the contraction of the walls, through the pulmonary artery, to the lungs. In the lungs it is rendered arterial and passes through the pulmonary veins to the left auricle, thence into the left ventricle and from there into the great aorta, by branches of which it is distributed to all parts of the body—reaching the muscles, glands, brain and all tissues of the body. It then passes through capillaries and enters the veins, by means of which it is brought again to the right side of the heart. The name vein is given to all vessels bringing blood toward the heart, regardless of the quality of the blood, and the artery is used for all blood vessels that carry blood from the heart. It will be at once understood that the pulmonary artery carries venous blood to the lungs and the pulmonary veins arterial blood from the lungs to the heart.

The muscular walls of the left ventricle are very thick, on account of the work devolving upon them of forcing the blood throughout the body. Those of the right ventricle are also thick and strong, but not nearly so thick as those of the left side; their work is merely to send the blood through the lungs. This is called the lesser or pulmonary circulation; the former is the greater or systemic circulation. The valves of the heart between the auricles and ventricles are membranes. There are three flaps on the right and two on the left side. On both sides they are attached to tendonous cords, and these in turn to muscles; by the contraction of the muscles the cords are held tense to prevent the valves from giving way under the pressure when the ventricles contract and from allowing the blood to pass back into the auricles. The beginnings of the pulmonary artery and the aorta are also guarded by bucket-shaped valves that close and prevent the return of blood to the heart as the latter is expanding. The walls of the arteries are very elastic and are put on a stretch when blood is forced into them from the left ventricle. Therefore they exert a steady pressure upon the blood by virtue of their elasticity, and the pulse which is felt in the arteries is lost in the capillaries and not felt in the veins. The veins have valves to aid in holding the blood from receding and to keep it moving toward the heart.

Heart′ wood. As the trunks of trees increase in diameter, new layers of wood are laid down each year upon the outside of the older wood. As the ascending sap moves along through the newer wood, it gradually abandons the older, more interior wood This wood gradually changes in character the most obvious feature usually being a change in color. The color of the heartwood differs in different trees, and gives the characteristic appearance to the various kinds of lumber. For example, walnut, oak or cherry lumber is recognized by and valued for the characteristic color of the heartwood of each.

Heat, a form of energy whose presence produces such sensations as those described by the words **cold, cool, warm, hot.** Two fundamental questions concerning the thermal condition of any body are the following: *What is its temperature?* and *How much heat does it contain?* But, before either of these can be answered, we must distinguish carefully between *heat* and *temperature* and learn how to measure each of these quantities.

TEMPERATURE

If two bodies, A and B, are placed side by side in contact, and B thereby gains heat and becomes warmer, be it ever so little, A has imparted heat to B; and A is said to have a higher temperature than B. But if we place B in contact with another body, C, and find that B thereby loses heat, we say that C is at a lower temperature than B. In general, difference in temperature between two bodies is that which determines which way the heat flows. Accordingly, Maxwell defines temperature as follows: "The temperature of a body is its thermal state with reference to its power of communicating heat to other bodies." An instrument which indicates temperatures is called a *thermometer*. See Thermometer.

TRANSFER OF HEAT

Having defined temperature as that which determines the direction of the flow of heat, we next consider the various modes by which heat is transferred or diffused. Of these only two methods are known, namely: Conduction and Radiation.

CONDUCTION

The former of these processes is familiar to everyone who has used a silver spoon in a cup of hot tea or in a plate of icecream; for in the one case the spoon evidently conducts heat from the tea to the hand and in the other case from the hand to the icecream.

Very little is known about the mechanism by which the particles of a solid body hand on heat from one to another. But experiment has shown that the rate at which heat flows through a solid depends upon four things only: the material of the bar; the length, l, of the bar; the area of cross-section, s; and the difference in temperature, θ, between the ends of the bar. We may summarize these facts by writing

$$\text{Rate of Flow of Heat} = \frac{K\theta S}{l},$$

where k is a constant depending upon the material of which the bar is composed. This is the fundamental equation of heat-conduction. In the case of fluids the equalization of temperature goes on much more rapidly than it otherwise would, on account of the mixing which is always going on automatically; the cooler and hence denser portions falling to the bottom of the containing vessel. This process of transferring heat from one part of a fluid to another is called *convection*. It is illustrated in the heat which is carried up the chimney. The mixing is a mechanical process; the transfer of heat takes place by conduction.

RADIATION

One of the earliest observations made after the discovery of the airpump was that both light and heat pass through a vacuum with the utmost ease. Even the perfect vacuum which exists between us and the sun is traversed every day by enormous amounts of heat. The process by which this transfer is made is called radiation. Numerous experiments show that radiant heat is reflected, refracted and polarized according to the same laws that light obeys and that light and heat are merely different kinds of radiant energy — alike except in wave-length. See Light.

The fact that a body, when heated, emits exactly those kinds (wave-lengths) of radiant energy which the same body would absorb, if cool, is the foundation of the modern science of spectroscopy.

EFFECTS OF HEAT

Among the numerous effects of heat the most important probably are the following three: Change of dimension or change of stress; change of molecular state; and change of temperature.

Nearly all bodies increase in size when heated. Stretched rubber is an exception to this rule; and it is well known that water, when heated from 0°C to 4°C, diminishes in volume. The fraction of its length by which a solid changes its length when heated one degree Centigrade is known as its coëfficient of linear expansion.

The following table will show how the principal metals behave when heated:

COEFFICIENTS OF LINEAR EXPANSION

Glass	0.0000085
Platinum	0.0000085
Steel	0.000012
Brass	0.000018
Copper	0.000019
Aluminium	0.000023
Zinc	0.000029

It may be easily shown that the rate at which the volume of a solid changes with temperature is very exactly three times its coëfficient of linear expansion. Liquids can change, of course, only in volume. It is the volume-expansion of mercury that is employed in our ordinary thermometers. For the laws of expansion of gases see Charles' law and Boyle's law.

CHANGE OF MOLECULAR STATE

If a piece of cold ice have heat applied to it, the temperature of the ice will keep on increasing until a certain point is reached where it begins to melt. Then it is found to be impossible to change the temperature of the ice by applying heat to it; for all the heat applied goes to melt the ice into water *at the same temperature.* After the ice is all melted, the water can be changed in temperature until you reach its boiling-point. After that, all the heat applied is spent in converting the water into steam, *at the same temperature.* The same phenomenon happens in the case of nearly all solids and all liquids, provided the pressure remains constant while the heat is applied.

CHANGE OF TEMPERATURE

As everyone knows, the effect of heat is, in general, to increase the temperature of a body. Two exceptions to this rule, *melting* and *boiling*, we have just noted.

QUANTITY OF HEAT

The arbitrary unit of heat employed in physics is defined as *that quantity necessary to raise the temperature of one gram of water from 0° to 1° Centigrade.* This is called a *calorie.* It was early discovered that equal amounts of heat applied to equal masses of different substances do not produce the same rise in temperature.

The ratio between the amount of heat required to raise the temperature of any body one degree and that required to raise the temperature of an equal mass of water one degree is, accordingly, known as the specific heat of the substance. The amount of heat, H, required to heat a mass, m, from the temperature $t_1°$ to temperature $t_2°$, is described as follows:

$$H = m\,C\,(t_2° - t_1°)\text{ calories,}$$

where C is the specific heat of the substance. The amount of heat required just to melt one gram of a solid substance, *without changing its temperature*, is called the heat of fusion. This is the quantity which used to be known as latent heat. The heat of fusion of ice is 79 calories per gram. In a strictly analogous manner, experiment shows that it takes a definite amount of heat just to vaporize one gram of any liquid without changing the temperature. This quantity is called the heat of vaporization. To evaporate one gram of water without changing its temperature, 536 calories are required. For an account of the nature of heat and of the evidence for thinking heat a form of energy see THERMODYNAMICS and STEAM-ENGINE.

HENRY CREW.

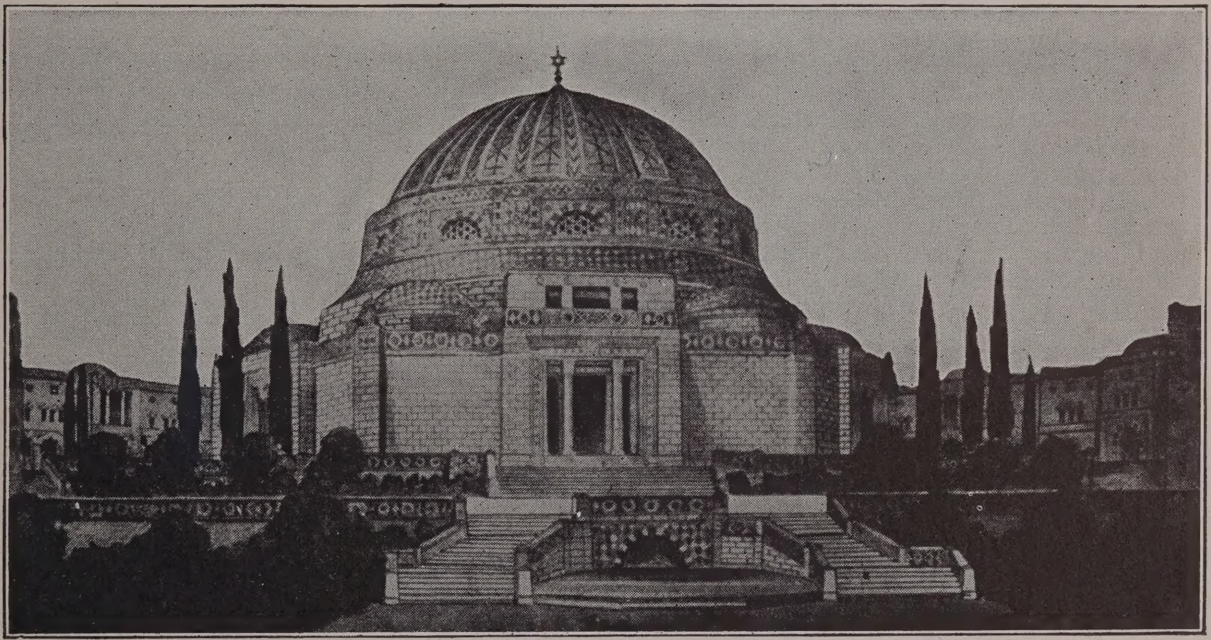
Heat'ing and Ven'tila'tion, a branch of engineering dealing with the practical application of the laws of heat to the designing, construction and installation of apparatus for the warming and ventilation of buildings. Ventilation requires a regular and continuous change of air in a room in order to maintain the air at a required standard of purity, and is evidently intimately connected with the subject of heating. Practical systems of ventilation are always installed in connection with the heating system. The requirements of a heating system are that it shall be capable of maintaining a certain temperature in the space considered under all conditions of weather. In Europe the temperature demanded for living rooms is about 59° F. In the United States it is fully 10° higher. A heating system must consider, first, the production of the necessary heat as in a fireplace, a stove, a steam or hot-water boiler or in an electric radiator; second, the means of transmitting and diffusing the heat economically to the room which it is desired to heat. Stoves and fireplaces are placed in the rooms to be heated, and of course require no means of transmission. Steam and hot water may be transmitted in pipes to radiators in the rooms to be heated (direct radiation system), or the radiators may be placed at a convenient point and used to heat the air which is to pass into the rooms to be warmed (indirect radiation system).

The common hot-air furnace system is an indirect radiation system, in which the air is heated by contact with the iron walls of the furnace and then led by ducts through the house. In indirect systems the diffusion of the air may be by the tendency of hot and lighter air to rise or by some mechanical means as by fans and blowers. Fans and blowers are used in all successful indirect radiation methods of warming large buildings. The quantity of heat that must be produced depends mostly upon the losses in transmission through the walls and windows of the building and on the heat required to warm the fresh air required for ventilation. The losses in transmission and by conduction might be reduced to a very small quantity by construction, but healthy animal life requires a continual supply of fresh air. A common rule is to supply 30 cubic feet of fresh air per minute for each occupant of a room. In ordinary dwellings and in other buildings not occupied by large numbers, sufficient fresh air is ordinarily supplied by so-called natural ventilation, that is, by the ordinary drafts through doors, windows etc.; for buildings occupied by large numbers of persons, such as school-houses, theaters etc., some method of forced ventilation must be used. This may be done by drawing out the impure air (the aspirating system) or by forcing in fresh air by a blower (the plenum system). The latter method is much more successful. One of the advantages of indirect radiation systems is that the heating and the ventilation demands are both satisfied.

Of the three systems of heating by hot-air furnace, steam and hot water, the hot air is the least costly to install and the steam system next. Hot water requires more radiating surface, and hence costs from 25 to 30 per cent. more. In economy of fuel hot water is cheaper than steam, and steam in turn cheaper than the hot-air furnace. A direct radiation system is in general considerably cheaper to operate than the indirect, but costs more to install. Heating by electricity is very expensive, as not more than 4 or 5 per cent. of the heat of the fuel reappears as heat, but it may be advisable in certain cases on account of the convenience, as in street cars. The heat is produced by passing an electric current through iron or other metallic wires. The heating and ventilation industry is one of the largest in the world. Data of competent authorities place the annual expenditure in the United States at $50,000,000 or over.

Hebe (*hē'bė*) was the goddess of youth in ancient mythology — the daughter of Jove and Hera, who became the wife of Hercules after he was made a god. Until Ganymede succeeded her, she was cupbearer to the gods. She was supposed to have the power of restoring the aged to youth.

He'brews. See Jews.



HEBREW UNIVERSITY

Hebrew University. On Mount Scopus, in Palestine, commanding a view of the plain the Children of Israel saw as they entered the Promised Land, and on the hill where the Roman armies conquered the Jewish people, stands the Hebrew University of Palestine, dedicated in 1925.

The Zionist (see Zionism) movement has been going forward for some time. The dream of the Jewish people has been to re-establish their national life in the country of which Jerusalem was the capital. Racial purity, an ancient heritage of customs, traditions and religious concepts, and anti-Semitic feeling in old Russia and Germany have brought to life the World Zionist Organization. Many Jewish families have organized agricultural colonies in Palestine. With the capture of Jerusalem by the British, and its separation from Turkey, the movement has been aided. In six years following the World War 45,000 Jews came to Palestine, and immigration is proceeding at the rate of 2,500 a year. Jaffa now has a modern suburb of 19,000; there is a Jewish high school in the city containing 2,000 students as well as the Tachkemoni school. There have been nearly a hundred settlements established since the World War.

The university below pictured drew its faculty from Russia, England, France, Germany and the United States. The language of instruction is Hebrew.

Hebrides (*hĕb'rĭ-dēz*) or **Western Islands,** the name applied, collectively, to the islands off the western coast of Scotland. Their total number is over 500, but hardly one fifth of them are inhabited. They are the scene of Scott's poem, *The Lord of the Isles.* See Buchanan's *Hebrid Isles.*

He'bron, one of the oldest Palestinian cities, belonging to the tribe of Judah, lies about 21 miles southwest of Jerusalem, in the valley of Eshcol, famous for fruit, and for seven years was the residence of King David.

Hec'ate, a goddess of Grecian mythology. There seem to have been various myths concerning her, some of them making her one of the Titans, honored by the Olympian divinities, whom she assisted against their enemies. But she was oftenest imagined to be one of the infernal deities and a being of mysterious and malign character. She was worshiped in fear, with gloomy sacrifices and magical rites.

Hec'la, or **Hakla** is a volcanic mountain in Iceland, standing alone, about 20 miles from the coast. It is 5,102 feet in height, and has five craters. There have been 18 eruptions from it since the 9th century, the last, in 1845, lasting over a year. In the eruption of 1783 the stream of lava was 45 miles long and 15 wide, the largest amount of lava thrown out at one time from a volcano.

Hec′tor, the ideal hero of the Trojans, was the son of King Priam and Hecuba, his second wife, and the husband of Andromache. Homer in his *Iliad* tells the story of his valor during the siege of Troy by the Greeks and of his death by the hand of Achilles, who dragged his body, attached by his feet to a war-chariot, around the walls of Troy.

Hecuba, (*hek′ū-bä*), the second wife of Priam, king of Troy. During the Trojan War she saw her husband and all but one of her sons killed. After the fall of Troy she fell into the hands of the Greeks as a slave, and, after suffering inhuman cruelties, threw herself into the sea. On this story Euripides founded one of his great tragedies, *Hecuba.*

Hedge′hog, an insect-eating animal, common in Europe, usually with the fur of the back and sides mixed with spines. It should not be confused with the porcupine of Canada and the United States, which is a much larger animal of a different family. The common hedgehog is about the size of a large rat, and other representatives of the family are smaller. They have a pointed snout, and feed on insects, mice and eggs. About 19 species are found in Great Britain, Europe and Asia. Some forms have no spines. Those with spines roll themselves into a ball when attacked.

Hedin, Sven Anders (*hĕ-dēn′, svĕn än′-dĕrz*), a Swedish geographer and explorer, was born at Stockholm on Feb. 19, 1865, and educated there and at the Universities of Upsala, Berlin and Halle. His works include: *Through Persia and Mesopotamia, King Oscar's Embassy to the Shah, Through Khorassan and Turkestan* and *Through Asia.* All of these are written in English. All of the great geographical societies regard his work as peculiarly valuable.

Hegel (*hā′gel*), **Georg Wilhelm Friedrich,** was the last in a succession of the four great German writers who developed the philosophy of what is known as the ideal school; the other three being Kant, Fichte and Schelling. Hegel was born in Stuttgart, Germany, Aug. 27, 1770, and was, with Schelling, educated at the University of Tübingen. Until 1806 he was of the faculty of the University of Jena and joined Schelling in publishing *The Critical Journal of Philosophy.* Thus these two became so identified with each other that their works could hardly be distinguished, and it was not until 1807 that Hegel's *Phaenomenology of Spirit* earned him personal distinction. In 1812 he published the first volume of *Logic,* his greatest work. In 1816 his growing fame as a writer earned him a professorship at Heidelberg, which he exchanged two years later for the chair of philosophy at Berlin, where he continued to teach until Nov. 14, 1831, when he died of cholera. During these years he wrote many books, the most noteworthy being *The Philosophy of Right; Philosophy of Religion; Philosophy of Art; History of Philosophy;* and *Philosophy of History.*

Hegira (*hej′i-rä*) is from an Arabic word meaning going away, and is applied to the flight of Mohammed from Mecca, June 20, 622 A.D. A Mohammedan, however, would be offended if you should refer to this event in the life of the founder of his religion as a "flight"; for the word means literally not a flight but an emigration. The tribe of the Koreish having resolved to slay the new prophet, their kinsman, he secretly left Mecca and repaired to Medina, where, partly from a feeling of jealousy towards Mecca, partly because his new doctrine had already found here many new adherents, he was so well received and so vigorously supported in the wars which he now began to wage against his adversaries, that the rise and progress of Mohammedanism was said to date in reality from the time of Mohammed's leaving Mecca. The Hedjrah, therefore, was made the starting-point of the Mohammedan era.

Heidelberg (*hī′del-bĕrg′*), an ancient city of Baden, Germany. It lies 380 feet above sea-level, at the base of the Königsstuhl, 1,863 feet high, on the left bank of the Neckar. The city is celebrated for its university, founded by Rupert I in 1386, which flourished up to the era of the Thirty Years' War, when it declined until its restoration in 1802. It has courses in philosophy, law, medicine and theology, about 148 professors and 1,922 students. The library contains over 500,000 volumes and 4,700 manuscripts. Many of Germany's most famous scholars studied here. The city suffered by the Thirty Years' War; was taken by the French in 1689; and almost destroyed by them in 1693. Population, 56,010.

Heine (*hī′ne*), **Heinrich,** was born of Jewish parents, at Düsseldorf, Germany, Dec. 13, 1799. At 16 he was sent to Frankfort to learn banking, but soon gave it up to commence trading on his own account, but failed. He studied law at the universities of Bonn, Berlin and Göttingen. In 1821 he brought out his first volume of *Sayings.* But the world only became aware that a poet of the first rank had risen, when in 1826 there appeared the first volume of *Travel-Pictures. The Book of Songs* was published next year, and caused the greatest excitement. These two works are Heine's masterpieces. His songs have the freshness and melody of a skylark's note. His being baptized a Christian in 1825 cost him the friendship of the stricter Jews, and his outspokenness in regard to the governments of the day kept him from obtaining a government office. His relatives were shrewd business men, who could see no virtue in being a poet, and the public censor condemned Heine's poems. So, dissatisfied with Germany, the poet went to Paris, where Thiers became his patron and the chief men then living at the capital his comrades. He at once turned from poetry to politics, playing the role of leader of the people. Heine was always an Ishmael, both in poetry and in politics — he would fight under nobody's flag but his own. In his writings he said many bitter things, and was always in hot water, but his love for men was warm and deep. He died at Paris, Feb. 17, 1856. See his *Life* by W. Sharp.

Hel'en of Troy, one of the most beautiful women of ancient history. She was the daughter of Zeus and Leda and wife of the Spartan king, Menelaus. She was carried off by Theseus at the age of ten, but was recovered by her brothers, Castor and Pollux. Among all the Greek princes who paid her court, she chose Menelaus. Then Paris, the son of Priam of Troy, carried her off, and Menelaus, gathering all the Greeks about him, began the ten years' Trojan War. Upon the death of Paris she was married to his brother, Deiphobus, but betrayed him to Menelaus and returned with her husband to Sparta. Helen is the subject of story and poem by Vergil, Homer, Pausanias, Euripides and Goethe. See *Dream of Fair Women* by Tennyson and *Helen of Troy*, poem and essay by Lang.

Hel'ena, the capital of Montana, also is the county seat of Lewis and Clarke County. It is situated among the foothills of the Prickly Pear valley, near the base of the Rocky Mountains, about 14 miles from the Missouri River and 70 northeast of Butte. The surrounding country is both mineral and agricultural, and the city is principally made up of homes of cattlemen and miners. It is well-built, having good hotels and public buildings, chief among these being the government building, the state capitol and the county courthouse. Helena has excellent parish and public school systems, a high school costing $150,000, the Montana Wesleyan University, Saint Vincent's Academy and state and city libraries. There are several fine churches, Saint John's Hospital and St. Joseph's Orphanage. Marysville is the name of the largest mining-camp near the city, and four miles from Helena is the smelter of the American Smelting and Refining Company. The Missouri River Power Co., located on the river of this name, 12 miles from Helena, furnishes the city with electrical power for lighting, car-service and manufacturing. It has the service of the Northern Pacific and Great Northern railways. Population 12,515.

Helicon (*hĕl'ĭ-kon*), a mountain-range situated in the southwest of Bœotia. In ancient Greece it was the fabled resort of the Muses. The poet Hesiod lived at its foot, and on its slopes were the two fountains whose waters were held to give inspiration to the poet.

Hel'igoland is a small island about a mile long and one third of a mile wide, situated in the North Sea. The island was conquered from the Danes in 1807 by Great Britain, and ceded to Germany in 1890 in return for the island of Zanzibar, off the east coast of Africa. The Germans fortified the island, protecting it by a great sea wall and used it as a base for their high seas fleet during the World War. At the end of the war Germany was required to completely dismantle the fortifications.

He'liograph, an instrument chiefly used in military operations in signaling messages from one station to another by means of a small mirror, which reflects to a distant point the rays of the sun cast upon it. The instrument is simple and portable, and when used is made to send messages to a distant point by the use of long and short flashes, thus spelling out words and sentences by the use of the dot-and-dash or Morse alphabet. The essential difference between messages by the heliograph and by the ordinary telegraph "sounder" is that in the first case the message is read by sight and across the distance at the station *sending* the same, and in the latter by sound and at the station to which it is *sent.*

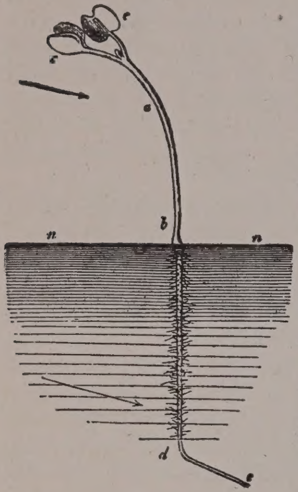
Heliopolis (*hē-lĭ-ŏp-ō-lĭs*) (city of the sun), one of the most ancient and important Egyptian cities, stood on the Pelusiac branch of the Nile. The obelisk now standing in Central Park, in New York, was first brought from this city to Alexandria. Heliopolis was the great seat of learning in ancient Egypt.

He'liotax'is (in plants). See Phototaxis.

He'liotrope the common name of species of the genus *Heliotropium*, which contains about 115 species widely distributed in warm regions, nearly 15 of which occur in North America. They are recognized by their spreading and one-sided clusters of flowers, which in the cultivated forms have a characteristic fragrance. The forms of cultivation are probably all derived from two species, the leading one being *H. Peruvianum*, native to Peru. The other species is *H. corymbosum*, also from Peru. The original color of both of these species is violet, but the colors of cultivation are various shades of purple to white.

Heliotrope or **Bloodstone** is a variety of chalcedony or jasper. It is found in almost all parts of the world, but the finest specimens are brought from Asia.

Heliot'ropism (in plants) is the sensitiveness of a plant to a change in the direction of light, to which it responds by placing its organs again in a definite position with respect to it. In many plants this is accomplished by a change in the rate of growth of some part, producing curvature and carrying attached parts into the new position. Thus, if a geranium plant be taken from a greenhouse and set before a window, the leaves are carried into a position facing the window by curvature of their stalks. This is the usual response of leaves of this kind, while radial leaves, as those of the onion, direct their tips toward the light. Some stems bend so as to direct the apex toward the light, and some roots turn away from it. Other plants accomplish like changes by means of the motor organs (which see), in which changes of turgor (which see) produce the curvatures that move the attached parts.



A young plant of mustard grown in water, showing heliotropic curvature caused by one-sided illumination. *n*, *n*, level of water: *b*, older part of stem; *a*, younger part where curvature occurs; *c*, *c*, primary leaves; *d*, sharp curve of root; *e*, the growing point. The arrows show the direction of the light.

He'lium. See ARGON.

Hel'lespont. See DARDANELLES.

Hell Gate is a pass in East River between Long Island and New York, for a long time dangerous to the passage of vessels, but in 1885 the obstruction was removed by blasting. See BLASTING.

Helm'holtz, Herman Ludwig Ferdinand von, one of the greatest physicists of the 19th century, was born at Potsdam, Prussia, August 31, 1821, and died at Charlottenburg, near Berlin, Sept. 8, 1894. He was educated at the Military Medical School at Berlin. Having taken his degree in medicine in 1842, he remained an army-surgeon until 1847, when he published his remarkable paper *On the Conservation of Energy*. This paper, which, perhaps, more than any other has dominated physical science during half a century, was refused publication by *Poggendorff's Annalen*, the leading physical journal of the world. It was published by the Physical Society of Berlin, July 23, 1847.

In 1849 he became professor of physiology and pathology at the University of Königsberg. In 1855 he accepted the chair of anatomy and physiology at Bonn and, three years later, the chair of physiology at Heidelberg. It was at the latter place that he prepared those two monumental volumes, *The Sensations of Tone* (1862) and *Physiological Optics* (1866). In 1871 he was called to Berlin as professor of physics. This university at once became headquarters for physical investigation, a position which it maintained for a quarter of a century. In 1888 Helmholtz was called to the directorship of the great National Physical laboratory at Charlottenburg, where he remained until his death in 1894. His investigations in hydrodynamics and geometry are of the first rank, and make him almost equally distinguished as physiologist, physicist and mathematician.

He'lotism (in plants). Two different kinds of plants have often learned to live together in such an intimate way, that they are usually found together. For example, a lichen is not a single plant, but it consists of an alga and a fungus living together. This general habit of living together in an intimate relationship is called symbiosis, and that form of it in which one plant is thought to enslave the other, that is to maintain it so that the former may live upon its products, is called helotism, the reference being to the Greek slaves of ancient times, who were called helots. Some think that the lichen is a case of helotism, the fungus having enslaved the alga. See SYMBIOSIS.

He'lots. See SPARTA.

Helvetii (*hel-vē'shĭ-ī*), a people of Celtic origin, so says Cæsar, who inhabited what is now western Switzerland. The chief event in their history was their attempt to migrate to southern Gaul, in which they were driven back with frightful slaughter by Cæsar in 58 B. C. Of 368,000 who left their homes, only 110,000 returned, and these became subject to Rome. The story is told in Cæsar's lifelike way in his *Commentaries*.

Hem'lock, a family of plants having small white flowers and a flattened, oval fruit. The best known and most important species is the common or spotted hemlock, growing by the wayside and on heaps of rubbish in all parts of Europe and Asia and now naturalized in America. It has a small root, resembling a parsnip, a bright green, hollow stem, two to five feet high and generally spotted with purple. The leaves are large, of a dark shiny green. The chief ingredient of the hemlock is an alkaline poison, causing weakness and staggering gait and finally paralysis and death. The leaves and fruit are used as a medicine, obtained by distilling or by drying and crushing to powder. Among the Greeks death by hemlock poisoning was the punishment usually meted out to criminals, and so Socrates died.

Hemlock, an evergreen tree of much grace and beauty. It grows in temperate North America, Japan, Central and Western China and the Himalayas. There are seven species. The trees are tall and pryamidal in shape, the bark furrowed and reddish, the branches slender and often pendulous, feathery, plume-like. The Canadian hemlock is found in upland forests and along rocky river-banks from Nova Scotia to eastern Minnesota and along the Appalachians to northern Alabama; it is an important forest-tree in the east and is at its best on the mountain slopes of North Carolina and Tennessee. It grows from 60 to 70, sometimes to 100 feet high. In the spring it is all alight with the yellow-green of its new leaves, which turn darker with age. The cones, which droop from the branches, are small and solitary. It is frequently planted as an ornamental tree, but is especially beautiful in the forest. With the growing scarcity of pine, hemlock has come to be used extensively as lumber though it is of inferior quality. The bark is extensively used in tanning leather. See Sargent's *Manual of Trees of North America*.

HEMLOCK

Hemp, the fibrous bark of several species of plants, the common hemp being *Cannabis savtia*, a member of the nettle family. This species is probably native to central Asia, but is widely cultivated. It also occurs in many places as a strong-growing weed. Forms in cultivation have received various names, but all are derived from the single wild species. They are tall, rough and strong-smelling plants, with leaves palmately cleft into five or seven coarse-toothed leaflets, and are easily recognized. The Manila hemp is obtained from a species of *Musa* (*M. textilis*), the genus to which the banana belongs. The cultivation of this fiber banana is confined almost entirely to the Philippines, where it is grown in very dense and extensive groves, the plants reaching a height of 20 feet or more. The sisal hemp is obtained from a species of agave (*A rigida*), which is largely grown in Yucatan as a fiber, thrives on the Florida Keys, and is used in the United States for making shipcordage.

HEMP

Henderson, Ky., the capital of Henderson County, on the Ohio River, a little south of Evansville, Ind., in the northwestern part of Kentucky. It is 144 miles west-southwest of Louisville, on the Louisville and Nashville, Louisville, St. Louis and Texas and Ohio Valley railroads. It has extensive woolen and cotton mills, tobacco-stemming, carriage and wagon manufactories, distilleries and car-works. It manufactures foundry-products, agricultural implements, furniture, flour etc. It has good schools, a number of churches and a sanitarium. The city owns its lighting plants and waterworks. Population 11,452.

Hen'dricks, Thomas Andrews, vice-president of the United States, 1885. was born near Zanesville, O., Sept. 7, 1819, and admitted to the bar of Indiana in 1843. He served successively as state legislator, congressman, United States senator and governor of Indiana. In 1876 he was the Democratic candidate for vice-president. In 1884 he was elected to the vice-presidency. He died at Indianapolis on Nov. 25, 1885. See *Life* by Hensel.

Hengist (*hĕn'gĭst*) and **Horsa,** the names of two brothers who led the first successful Teutonic invasion of Britain. Hengist is said to have conquered the whole of Kent. He is supposed to have died about 488 A. D.

Hen'nepin, Louis, a Franciscan explorer, was born at Ath, Belgium, about 1640. As a Franciscan he preached for some time at Halles, Belgium, He was chaplain of a regiment at the battle of Senef (1674) between the Prince of Condé and William of Orange. The next year he was ordered to Canada, and sailed with Bishop Laval and La Salle. For a while he preached in Quebec, then went to the Indian mission at Frontenac (Kingston, Ontario), and made a trip into the Mohawk country. In 1679 he joined La Salle's expedition. The *Griffin* was built, and the company sailed through Lakes Erie, Huron and Michigan to the mouth of the St. Joseph River. This they went up in canoes, carrying them five or six miles over the portage to the Kankakee, down which they floated, as, also, down the Iroquois to the Illinois. On the banks of the Illinois they built Fort Crévecœur, near where Peoria now stands. Hennepin was now sent with two others on a voyage of discovery, and was charged to meet La Salle at the mouth of the Wisconsin. Father Hennepin set out in a canoe, followed the Illinois to its mouth, and then explored the Mississippi till the party were captured by a band of Sioux and taken up the river to their villages. They were rescued from the Indians by Daniel Greysolon, who had made peace with the tribe, and carried back to Lake Michigan. While a captive, Father Hennepin discovered and named the falls of St. Anthony. He next sailed for France, where he published his *Description of Louisiana.* His last work, *New Journey in a Country Greater than Europe*, went through 24 editions in various languages. The date of Hennepin's death, which occurred in the Netherlands, is about 1703. See Spark's *Life of La Salle* in the Library of American Biography.

Henry I, king of England (surnamed *Beauclerc* or fine scholar), was the youngest son of William the Conqueror and the only one born in England. Tradition says he was born at Selby, Yorkshire, in 1068. After aiding his brother, Robert, to defend his domains in Normandy, he captured the royal treasury in England and, on the death of his brother, William Rufus, was elected king. He married Eadgyth (afterward called Matilda), the daughter of Malcolm of Scotland and Queen Margaret. His reign was successful, but often marked by cold-blooded cruelties. He was called the Lion of Justice. He died in 1135, and was succeeded by Stephen. See *Norman Conquest* by Freeman, and *Constitutional History of England* by Stubbs.

Henry II of England was the son of Matilda by her second husband, Geoffrey Plantagenet. Born at Le Mans, France, March 5, 1133 and succeeding Stephen by treaty, he was crowned on Dec. 19, 1154. His principal object in government was to make the church subservient to the state, but after a long struggle with Becket, once his prime minister and afterward a churchman, he was only partially successful. In 1173 his two sons, Henry and Richard, counseled by their mother, led a rebellion against him, and after partial defeat, he died at Chinon July 6, 1189. He ranks among the greatest of English kings.

Henry III of England was the son of King John, and was born on Oct. 1, 1207, succeeded his father in 1216, and died in 1272. He was a weak man, unfit to be king, but English freedom owes much to his unfitness and weakness, for the first real house of commons originated in 1265, when the boroughs first sent deputies to parliament, as the shires or counties had already sent knights. Simon de Montfort, Earl of Leicester, was the champion of *Magna Charta* and the people against the king. Henry's reign was exceeded in length only by those of George III (58 years) and Victoria (63 years). He was succeeded by his great son, Edward I.

Henry IV of England, the first king of the house of Lancaster, was born on April 3, 1366, and surnamed Bolingbroke from his birthplace. In 1385 he was made earl of Derby, and married Mary de Bohun. He led a roving life for some years, was present at the taking of Tunis in 1390, fought against the heathen on the shores of the Baltic and attempted to reach Jerusalem. In 1397 he supported Richard II against Gloucester, and in the following year was banished. Upon the death of his father his estates were forfeited. In July, 1399, he landed in York with three small vessels, and on September 29 he obtained from Richard, then a prisoner in the Tower, an abandonment of his claims to the throne. On the next day Henry arose in parliament and claimed kingdom and crown. His reign proved one of trouble, disorder and rebellion. Poverty and heavy taxes oppressed the people, and Henry's dependency on the wealth of the church caused him to allow severe laws against heretics to be made. In 1412 he sent two expeditions into France, but his closing years were a miserable succession of epileptic fits, in one of which he died at Westminster on March 20, 1413. See Gairdner's *The Houses of Lancaster and York* and Wylie's *History of England under Henry the Fourth.* See also Shakespeare's *King Richard II* and *King Henry IV.*

Henry V of England, the oldest son of Henry IV, was born on Aug. 19, 1387. He inherited his mother's good qualities and a soldierly disposition from his father. He was engaged against Glendower, the Welsh patriot, in 1401, and in 1403 he was wounded by an arrow at Shrewsbury. He was king's lieutenant in Wales until 1408, in 1409 constable of Dover and in 1410 captain of Calais. He was crowned on April 9, 1413. The great effort of his reign was the attempted conquest of France. On Aug. 11, 1415, he sailed for France with 10,000 men, captured Harfleur after a five weeks' siege, and proceeded toward Calais. On his way, at Agincourt, he was blocked by the French army, over which, on Oct. 25, he gained a victory against such odds as to make it one of the most notable in history. Two years later he again invaded France, and at the end of 1418 Normandy was in possession of the English crown. On May 21, 1420, the perpetual peace of Troyes was concluded, and Henry was made regent and heir of France, receiving in marriage Catherine, the youngest daughter of the king. He returned to England, but the news of the defeat of his brother, the Duke of Clarence, at Beaujé recalled him to France for the third time. He was meeting with his usual success at arms, when he was seized by sickness and died at Vincennes, Aug. 31, 1422, at the age of 35. He was religious, just and pure of life; a brave soldier and a brilliant general. In wisdom and solid policy he was inferior to many of his ancestors. See Gairdner's *Houses of Lancaster and York;* Nicolas's *History of the Battle of Agincourt;* A. J. Church's *Henry the Fifth;* Shakespeare's *Henry V.*

Henry VI of England, only son of Henry V, was born on Dec. 6, 1421, became king when eight months old, though he was not crowned until 1429, and died on May 21, 1471. He was gentle, pious, well-intentioned and weak. During his reign Joan of Arc caused the redemption of all France, except Calais, from the English; and the civil war, known as the War of the Roses, broke out and raged in England. This cost Henry his throne and the life of his son and heir. It also destroyed the ancient nobility and ended feudalism. Henry deserves permanent remembrance and regard as the founder of Eton College and of King's College, Cambridge.

Henry VII of England, the founder of the Tudor line, was born on Jan. 28, 1456. He was next in right of succession to Richard III, after the death of Richard's nephews. After the battle of Tewkesbury Henry fled to Brittany, and there remained until invited to invade England and overthrow Richard. His first attempt ended in failure, but in August, 1485, he landed at Milford Haven, marched across the country, and met Richard in battle at Bosworth, where the usurper was slain. He now ascended the throne, and his marriage with Elizabeth of York, whereby the red and white roses were united, took place in the following January. In 1492 he led an invasion into France, but the payment of 750,000 crowns bought him from his purpose — indeed, his reign was marked by never-ending effort to secure wealth, for when he died on April 22, 1509, he left a fortune which would now be worth $90,000,000. Yet he was considered an excellent ruler, an able and subtle politician and a successful diplomat. Like Henry IV, however, he acknowledged that he owed his throne to the people and their parliament. Bacon speaks of him as "a wonder for wise men." See Gairdner's *Henry the Seventh*.

Henry VIII of England, the second son of Henry VII, was born in 1491. Through his mother, Elizabeth of York, he united the rival claims of the houses of York and Lancaster. The death of his older brother made him heir to the throne, and he was betrothed to his brother's widow, Catherine of Aragon. He became king in 1509, and was very popular with his people during the first half of his reign. He was the most English of all English kings and the handsomest prince of his times. He had personal qualities that bound to him very strongly such men as More, Wolsey and Thomas Cromwell. For 20 years he was governed by his prime minister, Wolsey, whose intention was to give England importance by acting as an arbiter between Spain and France. In this period took place the meeting of the French and English kings on the field of the Cloth of Gold, the battle of Pavia and the sack of Rome. The fall of Wolsey was the result of his opposition to Henry's plan of divorcing his wife, Catherine of Aragon, to open the way for his marriage with a new favorite, Anne Boleyn. The pope refused his sanction, and Henry, whose reply to Luther had won him from Pope Leo X the title of Defender of the Faith, brought about the separation of England from Rome, making himself head of the church in England. The final breach of England with Rome came about in 1534. Henry's quarrel was with the pope, and not with the Catholic church, and he treated with equal severity the clergy of the old church and the new followers of Luther. In 1536 Anne Boleyn was executed in the Tower, and the day before the execution Henry married Jane Seymour, who died leaving one son, Edward VI. His fourth marriage was a political one, brought about by his minister, Thomas Cromwell, for the sake of gaining the Protestant interest of Germany. But Anne of Cleves failed to win the regard of the king and was divorced, carrying down Cromwell, who was executed for treason. Henry's fifth wife was Catharine Howard, who in less than a year suffered the same fate as Anne Boleyn, in her case deservedly. Henry's sixth wife was Catharine Parr, who had the good fortune to survive her husband. Henry died at Westminster, Jan. 28, 1547, unhonored and unmourned. The tyranny that had shown itself in his home-life had grown with his exercise of power, till no man's life was safe who thwarted him. The names of his victims, Wolsey, Cromwell, More, Surrey and Fisher, prove him to have been uninfluenced either by gratitude or merit. But he loved his people, and held England firmly to the path of progress. See *History of England* by Froude; *Lectures on Mediæval and Modern History* by Stubbs; and *Reign of Henry VIII* by Brewer.

Henry II of France, was born on March 31, 1519, married to Catharine de Medici in 1533, and succeeded his father, Francis I, in 1547. He captured Calais from the English during his invasion against her in connection with the Guises. In 1559 he was wounded by a Scotchman when off his guard in a tournament, and died of his injuries on July 10.

Henry III of France, the third son of Henry II and Catharine de Medici, was born on Sept. 19, 1551. He was zealous in the Catholic cause, taking part in the massacre of St. Bartholomew. Through the intriguing of his mother he was elected to the throne of Poland, but, hearing of his brother Charles' death, he fled to France and succeeded him (1574). The incessant wars between the Huguenots and Catholics were features of his reign; but his time was given to riotous excesses and outbreaks of religious fanaticism. He was stabbed by a Dominican friar, Jacques Clement, on Aug. 2, 1589, and died the next day. See M. W. Freer's *Henry III, His Court and Times.*

Henry IV of France and Navarre, surnamed The Great and The Good, was born in 1553 at Pau, France. In 1569 his mother, fearing that he would be abducted to Spain and raised in the Catholic faith, carried him to Rochelle and placed him in charge of the Huguenot army, at whose head he fought the battle of Jarnac. In 1572 he was married to the French king's sister, Margaret of Valois, but within a week the massacre of St. Bartholomew occurred, and he was spared only on condition of professing Catholicism. Having done this, he was for three years held in reality a prisoner at the court of France, but in 1576 he escaped and rejoined the Huguenot army. However, on the death of Henry III, his right of succession was disputed, and he determined by force of arms to gain his rights; but it was not until he had formally professed himself a member of the church of Rome in 1593 that he was crowned in the next year, though he had ostensibly been king since 1589. Peace was not concluded until some years later (1598), when he signed the famous Edict of Nantes, giving liberty of worship to Protestants. After 19 unsuccessful attempts on his life, he was on the 14th of May, 1610, assassinated by a fanatic named Ravaillac. Henry IV is by many held to be the greatest as well as the most really French of all the kings of France. See M. W. Freer's *History of the Reign of Henry IV*.

Henry IV, emperor of Germany, was born on Nov. 11, 1050, elected king in 1054, and succeeded his father in 1056, his mother acting as regent. As with most of the monarchs of his time, his chief struggles were with and on account of the church. When he began to rule in 1070, all were arrayed against him — people, nobles, church and state, and his life was spent in continual warfare. His son, Conrad, was induced by Pope Pascal II to revolt, and Henry was imprisoned by Conrad. He escaped to Liege, and there died on Aug. 7, 1106.

Henry, called The Lion (born 1129, died 1195), Duke of Saxony and Bavaria, was the son of Henry the Proud and the head of the Guelphs. Bavaria had been taken from his father, but was restored to Henry the Lion in 1154, making him the most powerful noble in Germany, his dominions stretching from the North Sea and the Baltic to the shores of the Adriatic. His great power caused many princes to band against him in 1166, but he was able to hold his ground against his enemies, even when the German emperor, Frederick I, placed him under the ban of the empire. Henry's rule was an enlightened one. He encouraged farming and trade, fostered the commerce of Hamburg and Lübeck, and was the founder of Munich.

Henry the Navigator, a famous Portuguese prince, the fourth son of King Joao I, was born at Oporto in 1394. After the death of his father he took up his residence at Sagres, near Cape St. Vincent, and, while carrying on the war against the Moors, his sailors reached parts of the ocean never sailed before. His great ambition was to discover new worlds, and it was he who, single-handed, pushed Portugal into an unprecedented career of discovery. He erected an observatory and naval school at Sagres, and sent some of his pupils on voyages which resulted in the discovery of the Madeira Islands in 1418. Then he turned his attention to the Gold Coast of Guinea, and in 1442 one of his mariners sailed around Cape Nun and took possession as far as Cape Bojador. Next year a larger ship sailed 120 miles farther, and in 1440 Cape Blanco was reached. In 1446 his captain, Nuno Tristram, doubled Cape Verd, and in 1448 Gonzalez Vallo discovered three of the Azores. Henry died at Sagres, Portugal, Nov. 13, 1460. See Major's *Life of Prince Henry*.

Henry, Joseph, the foremost American physicist during the middle of the 19th century, was born at Albany, N. Y., Dec. 17, 1797, and died at Washington, D. C. May 13, 1878. Among his important achievements: (1) he showed how electromagnets should be wound, and how cells should be joined into batteries to produce the largest possible effect at the distant end of a long wire; (2) extended Faraday's work by showing that, not only does a primary current induce a secondary, but the secondary induces a tertiary, etc.; (3) was first to observe oscillatory discharge of Leyden jar, a phenomenon now used daily in wireless telegraphy; (4) made important contributions to knowledge of accoustics. He was from 1832 to 1846 a professor at Princeton, and thereafter secretary of the Smithsonian Institution.

Henry, O., the pen-name of William Sidney Porter, by many considered the best American writer of short stories, was born at Greensboro, N. C. Most of his education he received in what he called the "School of Hard Knocks." He worked in Texas as a journalist and bank clerk, and had the bitter experience of serving a prison sentence for embezzlement, although he was really innocent. In New York, where he lived the last eight years of his life, he saw deep into the heart of the city, and many of his best stories deal with the slums or the underworld. His best work is preserved in volumes entitled *Cabbages and Kings*, *The Four Million*, *The Gentle Grafter*, and *The Voice of the City*.

Henry, Patrick, one of the greatest orators of America, was born on May 29, 1736, in Hanover County, Va. After failing as a storekeeper and farmer, he became a lawyer. He acquired prominence by his defense against an unpopular tax-levy. He was a delegate to the first Continental

Congress at Philadelphia in 1774, and delivered its first speech. In 1776 he carried the vote of Virginia for independence, became governor of the state, and was four times re-elected. In 1795 he declined the secretaryship of state, which Washington offered him. He died in Virginia, June 6, 1799. See his *Life* by William Wirt.

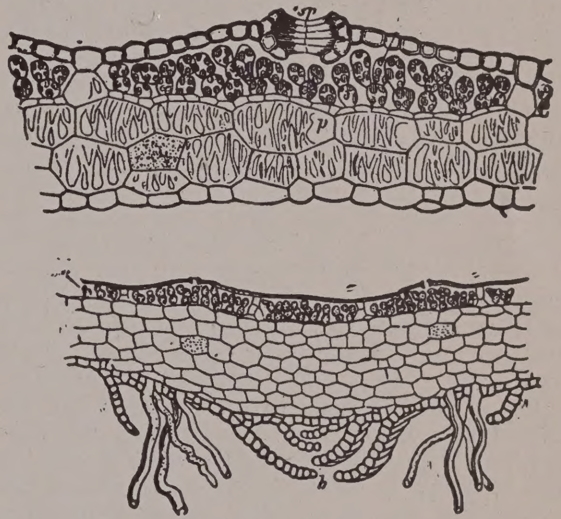
Hen'schel, George, born Feb. 18, 1850, at Breslau, Germany, is a composer, conductor and singer. He studied in Leipsic Conservatory and in Berlin under Kill and Schulze. His vocal and instrumental compositions are numerous, including some large works as well as shorter pieces. In 1881 he was appointed first conductor of the Boston Symphony Concerts, and in 1885–6 he assumed the same position with the London Symphony Concerts. For a time he succeeded Mme. Goldschmidt as professor of singing at the Royal College of Music, London.

Hen'ty, George Alfred, a prolific writer of juvenile stories, was born at Trumpington, England, Dec. 8, 1832. He was educated at Westminster School and at Cambridge, and served during the Crimean War and afterwards in Italy and England. Later he was correspondent for the London *Standard* in the Austro-Italian and Franco-German wars and the Abyssinian and Ashanti expeditions. He wrote *With Clive in India; In Freedom's Cause; Under Drake's Flag;* and stories of adventure, mostly for juvenile readers. He died on Nov. 16, 1902.

Hepatica (*he-pat'-i-ca*), a very early and well-beloved spring flower, color pinkish-blue or white, member of the crowfoot family. The blossoms come before the leaves, well-adapted for their early advent by a fuzzy covering about buds and stems; they are delicately fragrant, grow solitary on a long scape, and consist of six or more colored speals. The leaves are mottled with purple, grow from the root, and toward the base are heart-shaped. From the shape of the leaf the plant is sometimes known as liver-leaf. The leaves become leathery and thick, remaining green all winter. The hepatica grows on fringe of woods and in open pasture, is common in the eastern states, and grows westward to Minnesota and Missouri. It is a contemporary of the arbutus, truly a "brave little wilding."

Hepat'icæ. Plants which form one of the two great divisions of bryophytes and are commonly known as liverworts. They occur in a variety of conditions, some floating on the water, many on damp soil and rocks and many on the trunks of trees. The form most commonly seen (*marchantia*) is a flat green body (thallus) prostrate on damp soil or rocks, especially dripping cliffs. This prostrate habit gives a dorsiventral body, that is, one whose two sides are differently exposed and hence develop differently. In marchantia the upper or dorsal surface develops chlorophyll and those structures connected with the work of chlorophyll, while the under or ventral surface is not green, but puts out numerous hair-like processes ("rhizoids") which lay hold of the substratum and act as anchoring and absorbing organs. On the upper surface of this liverwort and in some others little cup-like bodies (cupules) are often seen, which contain small reproductive bodies ("gemmæ"). At certain times vertical branches arise which bear the sex organs (antheridia and archegonia). This green thallus body, therefore, is the gametophyte. When the sexual spore (oöspore), produced in the archegonium by fertilization, germinates, it does not produce another thallus-body, but a more or less stalked spore-case full of asexual spores, among which are the curious "elaters" (which see). This spore-case, therefore, is the sporophyte, and when its spores germinate they produce the green thallus-body or gametophyte. This is a good illustration of alternation of generations (which see). There are three great liverwort lines: (1) Marchantiales, with thick bodies and even outlines, except for the dichotomous branching; (2) jungermanniales or "leafy liverworts," so named because the thin body is broken into two rows of close-set leaves and resembles a delicate moss; (3) anthocerotales, in which the thin body bears a

Marchantia, showing the antheridial branch rising from the thallus body.



HEPATICÆ
Sections of Marchantia, showing chlorophyll tissue (*chl*), air-pore (*sp*), and rhizoids (*h*).

very peculiar spore-case (see anthoceros). The second of these lines contains by far the greatest number of species, many of which are associated with mosses and lichens in covering tree-trunks and are commonly mistaken for mosses. The liverworts are of special interest from the fact that they probably have been derived from the algæ, and in turn have given rise to the mosses and ferns. J. M. Coulter.

Hep′hæstus. See Vulcan.

Heptarchy (*hĕp′tärk-ȳ*), the name sometimes applied to the seven kingdoms supposed to have been established by the Saxons in England. It is a misleading term, an error, unless the chief kingdoms at different periods be meant. The chief kingdoms at different times between the 5th and 9th centuries were Wessex, Sussex, Kent, Essex, East Anglia, Mercia and Northumbria.

Hera or **Here** (*hē′rē*). One of the names of Juno. In the Roman mythology she was queen of heaven and wife of Jupiter. She presided over womanhood, maternity and chaste wedlock and very young children. She was also imagined to have supervision over the public finances and justice. Hera is the Greek and Juno is the Latin name for the same person. See Juno.

Her′aldry, in the sense most commonly used, is the knowledge of the laws that regulate armorial bearings, that is, the devices that appear on shields, their crests, supporters and badges. The custom of using a coat-of-arms may be traced to very early times, as to the standards of the twelve tribes of Israel, of the Egyptians and the Roman eagle. From these times grew up the custom of clans and families distinguishing themselves from others by signs and emblems. After a while it was considered the right of all noblemen to use a coat-of-arms, no two families being allowed to use the same. A coat-of-arms is composed of a shield or escutcheon on which the charges or emblems are depicted. Often the charges used bore some relation to the names or residence of the user, and, in the case of rulers, the arms of the country or countries over which he presided. See Boutell's *Heraldry, Historical and Practical.*

Herat (*hĕr-ät′*), capital of the most westerly of the three divisions of Afghanistan, lies on the Heri-Rud River, 2,500 feet above sea-level. It is a strongly fortified city, and the citadel is occupied by a British garrison. It is one of the most important markets of central Asia, and lies in a district famous for rich crops and excellent fruits. Herat is the military and political key to central Asia, having for a long time been a bone of contention between England and Russia. In 1890 it was planned to connect it by a railroad with India, but the project has as yet not been carried out. Its exports are indigo, dried fruits, dyes, asafœtida, rice, wool, carpets, raw hides, silk and leather wares; while chintzes, cloth, sugar, ironware and European wares are imported. Its population changes from time to time, and averages about 50,000. See Malleson's *Herat.*

Her′bart, Johann Friedrich, a noted German philosopher and educator, was born at Oldenburg in 1776, and died in 1841. He studied under the idealist Fichte, and, after teaching philosophy during 1805–9 in the University of Göttingen, was called to the chair which the great Immanuel Kant had filled for so long at Königsberg. Herbart returned to Göttingen to teach during the eight years previous to his death. His interests were divided between philosophy, psychology and education; or rather, these three studies for Herbart involved one another. As a philosopher, Herbart was a realist. He rejected the idealism of Fichte and Schelling, and tried to work out the theory of the nature of the real *being,* underlying change, at which Kant had only hinted. Beneke and Lotze were in some sense disciples of Herbart. As an educator, Herbart was not immediately popular, but his ideas were taken up, elaborated and popularized by a vigorous and efficient school, which included the names of Ziller, Story, Dorpfeld, Staude and Rein. The Herbartian principles of education have had a very beneficent influence in England and America. A Herbart Society was founded in the United States in 1880 Through its agency the chief educational works of Herbart were translated into English, so that his name and ideas were soon in the mouths of all teachers. The chief works of Herbart upon education are the *General Pedagogy Deduced from the End of Education* (1804) and the *Outlines of Pedagogical Lectures* (1835). The dates show over how long a range of his life Herbart was occupied with education.

Herbart agrees with other educators, and indeed few other educators have insisted with such force, that character is the one end of education. Knowledge is a means to the good character. Herbart perhaps errs in attributing good character almost entirely to ideas, so that he might almost say with Socrates, that virtue *is* knowledge. But it was well for him to emphasize the moral import in all knowledge. There is a danger, however, that the Herbartian teacher may rely upon instruction alone to form the good character. Herbart thinks that morality is the necessary consequence of mental balance or of a many-sided interest. Accordingly, Herbart and his followers have demonstrated in great detail the importance of the place of *interest* in education. To understand fully the teaching of Herbart upon interest and upon the interrelation and *correlation* of studies, it is needful to make a study of his psychology and, perhaps, even his metaphysic. According to the psychology of Herbart, the mind is a system of masses of ideas, which combine mathematically together in the process of assimilation or *apperception*. Correlation of studies strengthens the masses of ideas, while these masses of ideas in their turn give rise to interests, and these to the will and character. The psychology of Herbart does indeed give a valuable account of the process of the association of ideas; but without allowing sufficiently for heredity or original mental tendencies and unities. Out of the description which Herbart has given of the nature of the mental process in apperception there has come the formal method of instruction by four steps: clearness, association, system and method. *Clearness* has been subdivided into the preparation and presentation of the subject-matter which is to be taught.

Her'bert, George, an English poet, born on April 3, 1593, in Wales. Of an extremely modest disposition, he was most beloved by all who knew him for his good and almost saintly life. He was called Holy George Herbert. His *Country Parson* and *The Temple* are perhaps the best known and most beautiful of his works. Such lines as "Sweet day, so calm, so cool, so bright, the bridal of the earth and sky" were not born to die. He died near Salisbury in 1633. See *Life* by Izaak Walton.

Herbert, Victor, a grandson of the novelist Samuel Lover, was born in Dublin, Ireland, in 1859, but has lived for the most part abroad and in America since 1886. He is a prominent composer, bandmaster and conductor. He has been chief violincellist in the Court Orchestra at Stuttgart, solo violincellist in the Metropolitan Orchestra of New York, conductor of the New York 22nd Regiment Band and conductor of the Pittsburg Orchestra. He has written a number of comic operas, including *Prince Ananias*, *The Wizard of the Nile*, *The Serenade*, *Cyrano de Bergerac* and *The Idol's Eye;* also an oratorio, *The Captive*. He died in 1924.

Herculaneum (*hĕr'kū-lā'nē-ŭm*), a city of Italy, formerly situated at the base of Mt. Vesuvius, by the eruption of which it was seriously injured in 69 A. D. and totally buried in 73 A. D. It now lies from 40 to 100 feet below the surface. In 1706 some relics were found, but no systematic excavations were undertaken until 1738, when what was supposed to have been the theater was uncovered and many beautiful statues and pictures taken from it. Of late years excavations have been again undertaken, and many art treasures from the entombed city now repose in the National Museum at Naples. The Italian government is now pushing excavation with renewed vigor.

Hercules (*hĕr'kū-lēz*), the son of Zeus and Alcmene of Thebes. Incurring the wrath of Hera, the wife of Zeus, he was made to serve Eurystheus, who enjoined upon him the performance of many difficult tasks. Thus he became to the Greeks the type of manly strength and manly endurance. The poets differ as to the number and character of the tasks set before him, but they are generally supposed to have been twelve, called the twelve labors of Hercules. The manner of his death is uncertain, although the story was that the poisoned robe of Nessus sent him by his wife so crazed him that he threw himself upon the funeral pyre of Mt. Œta, and was carried to Olympus, the heaven of the Greeks.

Hercules, Pillars of. See GIBRALTAR.

Her'der, Johann Gottfried von, one of the profoundest of German writers, equally well-known as philosopher, theologian and critic, was born on Aug. 25, 1744. He was essentially a poet of and for the people, translating legends and songs from Arabian, Spanish and old German poets, besides being a writer on all topics of deep and independent thinking. His greatest work, although left incomplete, was *Outlines of a Philosophy of a History of Man*. He died at Weimar, Dec. 18, 1803. See H. Nevinson's *Herder and His Times*.

Here. See HERA and JUNO.

Hered'ity, the transmission of physical and mental likeness from parent to offspring. It is a matter of everyday observation that the offspring is like the parent, and it raises this question: Why is this likeness transmitted; and how does the offspring inherit the peculiarities of parents? These questions are very difficult and have not been fully answered. Darwin supposed that in the chick, for example, minute particles, which he called gemmules, came from every part of the body and united in the egg, so that, when the young bird began its existence in the egg, there were little particles in that egg derived from every part of the parent animal, and traits and peculiarities were inherited through this channel. This is called the theory of pangenesis. Weismann's explanation has the advantage of being simpler. He points to the fact that the particular parts that connect one generation with another are the egg-cell and the sperm. He looks upon the many cells forming the body as a sort of vehicle to carry the germ-cells or those from which new life is produced. These structures, of course, are composed of protoplasm, and it has been discovered that within the nucleus of all animal-cells are located minute bodies that stain more deeply than the rest of the protoplasm and are therefore called chromosomes. These chromosomes are of the same number in all cells of the body of any particular animal, and they are supposed to be the particular parts of the living substance that carry the traits or qualities that are inherited. By a complicated process the chromosomes are equally divided whenever the cells undergo division, and produce new cells. Before developing, the egg, which is derived from the maternal source, becomes united with the sperm from the paternal source, and therefore, the fertilized egg contains elements derived from each parent. As the fertilized egg divides, there is each time an equal division of the chromatic material derived from these two sources. It follows, therefore, that every cell must contain some of the substance of both parents and this carries hereditary traits.

In 1866 there appeared a new principle governing the inheritance of many characters in animals and plants. The Mendelian law was discovered by Gregor Mendel, an Austrian Augustinian abbot (1822-84), who conducted experiments with peas. As a result of his experiments he showed that the height, color, and other characters depend on the existence of determinating factors or *genes* behaving as units. By careful analysis of the individual he proved it possible to determine the number and character of the *genes* which have worked together towards producing any characters. Mendel also showed how it was possible to synthesize these *genes* into new combinations. The Mendelian law was given no serious thought by biologists, however, until 1900. In that year de Vries of Holland, Correns of Germany, and von Tschermak of Austria, obtained results from their biological experiments similar to those of Mendel.

It is generally recognized that plants or animals exhibit three kinds of variation, namely, environment, functional, and organismal. Most naturalists emphatically refuse to acknowledge that it is possible to transmit or inherit any but organismal, congenital or germinal variations. This is the belief promulgated by Weismann in his biological experiments. Although Weismann admitted that germ-plasma might be modified to some degree by changes of nutrition and growth in the body, and that germ cells and body cells might be influenced by external conditions, he held firmly to his theory that no acquired characters could possibly be transmitted.

Pathologists have engaged in long and fruitful research on the subject of heredity. Today it is a well recognized fact that all congenital malformations and defects attributed to germinal faults are inclined to be transmitted to the offspring. One of their most important discoveries in recent years is concerned with congenital or constitutional diseases. It has been definitely proven that certain types of insanity and nervous diseases are inheritable.

See EVOLUTION; MENDEL, GREGOR; WEISMANN, AUGUST.

Hergesheimer, Joseph, an American author, was born on February 15, 1880, in Philadelphia, of Pennsylvania Dutch ancestry. He was a very shy lad, loving books, and was frequently ill. Joseph received his early education at a Quaker school in his native city, and at the age of seventeen entered the Academy of Fine Arts there, intending to be a painter. When he reached the age of twenty-one, he received a small inheritance. He immediately travelled to Venice and Florence, pursuing his chosen vocation until his funds were spent and he had a nervous breakdown. Months of illness and worry passed before he recovered sufficiently to return to his home in the United States.

At this time he realized that he would never achieve fame as an artist, and consequently he turned seriously to literature. In 1907 he was married to Dorothy Hemphill, of West Chester, Pennsylvania. For years he struggled to achieve success. The irony of fate was proved to him when his first accepted manuscript was *Caveolo Repeana,* a recipe for stuffed cabbage accepted by *Good Housekeeping,* but with Dorothy's signature. Soon after this, three articles by Hergesheimer appeared in the June, September and November, 1913, issues of *The Forum.* His first novel, *The Lay Anthony,* was published in 1914, and attested to his belief in his own ability. His popularity has steadily increased and his novels have appeared regularly.

His study of art is reflected in his works, which reveal a feeling for color, for shapes and texture, and a delight in luxury and elegance. These things have aided his writings greatly. He has created a world of romanticism and charm. His careful research into manners and customs of the American tradition through the years forms the foundation of his subject matter, but he colors all with the charm of beauty and sweetness.

The Hergesheimers live in an old Pennsylvania Dutch house called "The Dower House" at the time of the purchase. It is erected of builder stones on a hill just outside of West Chester. Hergesheimer scandalized the town when he bought the house, and also when he remodeled it extravagantly, making a luxurious living place out of it, in accord with the atmospheres in his books. He keeps an office in the business section of the city, where he begins work at nine o'clock in the mornings, writing in student's composition books with a stub pen. From these his secretary copies the manuscripts. Mr. and Mrs. Hergesheimer are known as "Dorothy and Joe" to everyone in West Chester. They entertain sumptuously. H. L. Mencken, George Jean Nathan, Alfred A. Knopf, and James Branch Cabell are frequent guests.

The most popular of Hergesheimer's works are: *Three Black Pennys* (1917); *Java Head* (1919); *San Cristóbal de la Habana* (1920); *The Bright Shawl* (1922); *Cytherea* (1922); *Balisand* (1924); *Tampico* (1926); *Quiet Cities* (1928); *Swords and Roses* (1929); *The Party Dress* (1930), and *The Limestone Tree* (1931).

Herkimer (*hûr'kĭ-mẽr*), a city and the seat of Herkimer County, New York, is situated on the Mohawk River, about fourteen miles southeast of Utica. The city is surrounded by a rich dairying region and thriving manufacturing center. There are extensive paper and knitting mills, furniture, and other manufacturing establishments in Herkimer.

The city was named in honor of General Herkimer who became famous during the American Revolutionary War. Fort Herkimer is situated in the immediate vicinity. Herkimer is also the seat of the Folts Mission Institute. In 1930 the population was 10,446.

Herkimer, Nicholas, a distinguished American soldier, was born in the state of New York in 1715, of German parents. His early life was spent on a farm in a region where educational advantages were few. During the American Revolutionary War he served as a soldier and in 1775 he was appointed colonel of the Tyrone militia. The following year he was promoted to the rank of brigadier-general and led an expedition successfully against Sir John Johnson's forces. He then marched to the relief of Fort Schuyler and during the siege which ensued, at the battle of Oriskany, was wounded in the leg. A careless operation to relieve his suffering cost the soldier his life. He died in August, 1777. A monument was erected in his honor on the site of the battle, Oriskany.

Hermannsson, Halldor, a prominent Icelandic philologist, was born at Vollur, Iceland, in 1878. He was educated at the University of Reykjavik and Copenhagen. After leaving the latter institution he journeyed to the United States. In 1905 he was appointed curator of the Fiske Icelandic Collection at Cornell University Library. He also taught Scandinavian languages at that university and in 1924 became professor of those tongues. Professor Hermannsson is the author of several works, the most outstanding of which are: *Icelandic Books of the Sixteenth Century* (1916); *The Periodical Literature of Iceland* (1918); *Modern Icelandic* (1919); *Bibliography of the Eddas* (1920); *Jon Gudmundsson and His Natural History of Iceland* (1924); *Eggert Olafsson* (1925), and *Two Cartographers* (1926).

Hermannstadt or **Sibiu,** a city in Rumania which played an important rôle during the World War. Prior to that struggle the city belonged to the kingdom of Hungary. During that conflict the Rumanian forces invaded Transylvania in August, 1916. On September 1, they were successful in capturing Hermannstadt and towns farther north. The Rumanian forces were recalled from Hungarian territory, however, when the Bulgarians invaded the Rumanian Dobrudja. Thus was the way opened to Falkenhayn to defeat the Rumanian First Army in the Battle of Hermannstadt at the close of September. This move was soon followed by the seizure of the Rothen Thurm or Red Tower Pass by the German troops, which is situated directly south of Hermannstadt. The Rumanian forces were thus cut off from their line of retreat, and necessitated their fighting a way to the Fogaras Mountains.

One of the most picturesque buildings in Hermannstadt is the Bruckenthal palace. It contains a picture gallery, and valuable numismatic, antiquarian, and mineral collections. There is also a library in the palace which is said to contain more than 100,000 volumes.

The principal industries of the city are tanning, wax-bleaching, and the manufacture of cloth, paper, candles, sugar, and hats. In 1930 the population was 48,013.

Hermes (*hûr'mēz*), in Greek mythology, an Olympian god, the son of Zeus and Maia. He was identified by the Romans with their god Mercury. Hermes was the herald and messenger of the gods and distinguished as a giver of increase to herds. He was also appointed as the guardian of boundaries, roads and commerce.

There are many and varied accounts of the Grecian Hermes. One myth tells of how, at the age of four hours, Hermes escaped from his cradle and finding the entrails of a sheep, twisted them into strips. These he stretched across a tortoise shell which served as a sounding board and thus did Hermes invent the lyre. He concealed the instrument in his cradle, and at eventide, being hungry, he set out in search of food. He bound his feet with myrtle and tamarisk branches to cover up his tracks along the way. Fifty oxen he stole from Apollo, and after driving them backward and forward until it would be difficult for anyone to discover which way they were travelling, he concealed them in a cave. Two oxen he roasted, part of which he ate and the rest he sacrificed to the gods. Apollo soon discovered the theft and was informed by an old man that a boy had been seen driving a herd in a most peculiar manner. Apollo immediately suspected Hermes and carefully followed him up Mt. Olympus into the presence of the almighty Zeus. Hermes was commanded by his father to make amends for his action, whereupon the lad delighted Apollo by offering him his lyre and trading it for a half interest in the oxen. Apollo presented Hermes with a messenger's wand, a staff of olive wood which was encircled by two twining serpents, adorned with a pair of wings at one end.

Hermes was also worshipped as the god of science, invention, eloquence, cunning, trickery, and theft. In Greek art he was usually represented as a slightly draped, beardless youth. The statue by Praxiteles, now at Olympia, represents Hermes in the nude, supporting the infant Dionysius on his left arm which rests upon a tree stump. The statue is of Parian marble. Still other statues of the god represent him with winged boots, the swift messenger. Others place a tortoise, a palm tree, a goat, an ibis or gull at his side, all of which were sacred to the god.

See MERCURY.

Hermit, a name applied to one who, desiring to be removed from all the cares and temptations of life, withdraws from the world and lives alone in some cavern or hut. The name is applied not only to those who withdraw from society from religious motives, but also to those who seek solitude from aversion to society or from the love of living alone. Centuries ago these recluses were termed eremites and anchorites, both terms being indiscriminately applied in this early day. Hermits did appear even as early as the third century. Those humans who first sought retirement from society were ascetics who withdrew from cities to rural districts and small villages.

The first hermit, that is one who withdrew altogether from society, is said to have been Paul of the Thebaid (Egypt), who fled to the desert to escape the Decian persecution, and died there at the age of 113 years. In 365, at the time of the death of Paul the deserts of Egypt, Syria, and Palestine fairly thronged with the huts of hermits. Oftentimes these recluses would return to their former abode, but only to offer warning and encouragement. On such occasions they were hailed as prophets by their fellowmen. One of the most peculiar group of hermits in history were the Stylites or pillar hermits, who spent their lives on the tops of columns. The rise of the convent and monastery gradually displaced the hermit and his hut.

Hermosa (*hẽr-mō'sȧ*) **Beach,** a city in Los Angeles County, California, is situated about twenty miles southwest of Los Angeles. There are thriving silk mills, and glass, tile, and mattress factories in the city. In 1930 the population was 4,796.

Hernia (*hûr'nĭ-ȧ*), a protrusion which is composed of an organ or part projecting through some natural or chance opening in the walls of the natural cavity surrounding the organ. The most common hernia is that of the abdominal viscera, although hernia of the brain, lung, or bowels may occur. The term which is popularly applied to hernia of the abdominal viscera is rupture.

The hernia is composed of a sac, which is a portion of the peritoneum, and its contents. The protruding viscera pushes this sac forward, thus forming a pouch. The contents of the sac, in addition to the viscera, always contain some fluid secreted by the interior.

There are three types of hernia: (1) reducible hernia or that type which may be returned into the abdomen; (2) irreducible in which condition the viscera cannot be returned to the abdomen, but no impediment to the passage of their contents or to their circulation is evident; (3) strangulated hernia, a most dangerous form in that a portion of the intestine or omentum protrudes and becomes so constricted that it cannot be returned into the abdomen and its circulation is halted. The danger of this type of hernia lies in the possibility of the development of a gangrenous condition about the strangulated part. Hernia is also classified frequently according to its location such as inguinal, or femoral hernia. Hernia is oftentimes congenital, although it may arise following any violent bodily exertion or constant pressure from the diaphragm and its surrounding muscles upon the abdominal viscera. The treatment of hernia may be either palliative or radical. The palliative treatment consists in wearing a truss to retain the protrusion in its proper cavity.

Hero and Leander, in Greek legend, two lovers whose story was made the subject of a late Greek poem which has been attributed to Musæus. Hero was a priestess of Aphrodite at Sestos on the Hellespont. Leander, who dwelt at Abydos, met Hero at a festival. He became enamoured and thereafter swam the strait each night from his home across the Hellespont to see her, guided by the light from her tower. One stormy night, venturing to make the passage, he was drowned. His body was washed up to the tower where Hero was stationed. Upon seeing the lifeless form of her lover, Hero plunged into the water that she might join him in death. The story is related in the work of both Musæus and Ovid. Both Hero and Leander have been represented in the works of the later artists.

Herod (*hĕr'ŭd*) **Agrippa I,** ruler of Palestine, was the son of Aristobulus, the grandson of Herod the Great, and the sister of Herodias, was born in 10 A. D. He was educated in Rome, where he lived so extravagantly that his debts forced him to flee and take refuge in Idumea. From Caligula and Claudius he received various tetrarchies, added to by those of Herod Antipas after his banishment, so that his dominions finally included all the old provinces of the Jews. He was very popular with them, particularly because of his vigorous persecution of the growing sect known as Christians. It was he who caused the apostle James the Greater to be beheaded, and had Peter thrown into prison. He died at Cæsarea in 44 A. D.

Herod the Great, King of Judea when Jesus was born in Bethlehem, was born in 72 B. C., the second son of Antipater. His father was elevated when Herod was fifteen, and he became governor of Galilee, and later of Cœle-Syria. He then became joint tetrarch of Judea with his brother. He was displaced by Antigonus, of the Hasmonean dynasty. Herod fled to Rome and pressed his claims, whereupon he was again given his tetrarchy and made King of Judea in 40 B. C. After the fall of Antony, he obtained the favor of Augustus. His reign was marked by the most atrocious cruelties and fearful butcheries. He killed every member of the Hasmonean family, fearing them because of the usurpation of Antigonus. He put to death his own wife, Mariamne, and their two sons. The Bible records his putting to death of the male children of Bethlehem, although many modern scholars regard the account as unhistorical. However, his reign was constructive in the matter of the rebuilding of Samaria, Cæsarea, and several other cities. He also restored the temple at Jerusalem. Herod the Great died in the year of Christ's birth, having enjoyed a reign of thirty-seven years as King of the Jews.